MONTHLY WEATHER REVIEW.

Editor: Prof. CLEVELAND ABBE.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for October, 1901, is based on reports from about 3,100 stations furnished by employees and voluntary observers, classified as follows: regular stations of the Weather Bureau, 159; West Indian service stations, 13; special river stations, 132; special rainfall stations, 48; voluntary observers of the Weather Bureau, 2,562; Army post hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Railway Company, 96; Hawaiian Government Survey, 200; Canadian Meteorological Service, 32; Jamaica Weather Office, 160; Mexican Telegraph Service, 20; Mexican voluntary stations, 7; Mexican Telegraph Company, 3; Costa Rican Service, 7. International simultaneous observations are received from a few stations and used, together with trustworthy newspaper extracts and special reports.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Mr. Curtis J. Lyons, Meteorologist to the Hawaiian Government Survey, Honolulu; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Mr. Maxwell Hall, Government Meteorologist, Kingston, Jamaica; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Commander Chapman C. Todd, Hydrographer, United States Navy; H. Pittier, Director of the Physico-Geographic Institute, San Jose, Costa Rica; Capt. François S. Chaves, Director of the Meteorological Observatory, Ponta Delgada, St. Michaels, Azores, and W. M. Shaw, Esq., Secretary, Meteorological Office, London; Rev. Josef Algué, S. J., Director, Philippine Weather Service.

Attention is called to the fact that the clocks and self-registers at regular Weather Bureau stations are all set to seventy-fifth meridian or eastern standard time, which is exactly five hours behind Greenwich time; as far as practicable, only this standard of time is used in the text of the REVIEW, since all Weather Bureau observations are required to be taken and recorded by it. The standards used by the public in the United States and Canada and by the voluntary observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is 157° 30′, or 10^h 30^m west of Greenwich. The Costa Rican standard of time is that of San Jose, 0^h 36^m 13^s slower than seventy-fifth meridian time, corresponding to 5^h 36^m west of Greenwich. Records of miscellaneous phenomena that are reported occasionally in other standards of time by voluntary observers or newspaper correspondents are sometimes corrected to agree with the eastern standard; otherwise, the local standard is mentioned.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now always reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

During the temporary absence of Professor Abbe, Mr. H. H. Kimball has been designated Acting Editor of the REVIEW.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

Forecasts of the direction and force of the wind and the state of the weather along the transatlantic steamer routes from the American coast to the Banks of Newfoundland were issued daily at 8:00 a. m. and 8:00 p. m., seventy-fifth meridian time. These forecasts covered the first three days out of steamers bound east from United States ports, and the morning forecasts were published in the weather maps issued at Boston, New York, Philadelphia, Baltimore, and Washington.

Three storms apparently crossed the North Atlantic Ocean from the American to the European coast. The first of these passed off Newfoundland on the 1st, was encountered over mid-ocean during the 2d, and was central north of the British Isles on the 3d. During the 4th, 5th, and 6th this disturbance apparently deepened and caused gales on the British and northwestern European coasts. During the night of the 18–19th a storm of marked strength passed north of east over Newfoundland, was reported in mid-ocean on the 20th, and reached the Irish coast, with diminished intensity, on the 21st. On the morning of the 18th shipping interests were advised as follows:

> Severe storm will move north of east over Newfoundland to-day and will be encountered over mid-ocean by steamers leaving European ports bound west.

During the night of the 24–25th a storm crossed Newfoundland, which apparently passed north of Scotland during the 27th and 28th.

Vessel interests on the Great Lakes and along the United States coasts were fully advised regarding the winds of the month. In the Lake region the only notable storm of the month occurred on the 12th and 13th. In the West Indies no well-defined hurricane appeared.

The frosts of the month were accurately forecast. The first killing frost of the month in the cranberry district of Massachusetts was forecast twenty-four hours in advance, and timely warnings were given of the frost that occurred in northern parts of the middle and west Gulf States. Frost was frequent in Washington and Oregon east of the Cascade Mountains.

On the 12th snow was reported in southwest Nebraska, and on the 16th the first general snow of the season occurred in western New York.

The night of the 16th the raisin interests of the San Joaquin Valley were notified of the rain which fell in that section on

the 17th, and rain warnings were issued the morning of the 23d for the heavy rain which fell generally in California on the 24th and 25th.

The following letter refers to a special long-range forecast for Lynchburg, Va., made upon the request of Mr. Withers P. Clark, of the Lynchburg Fair Association:

On behalf of the Lynchburg Fair Association, I wish to express to you our appreciation for the four days forecast furnished by you, at our request, just previous to our recent fair and carnival. In calculating the relative chances of success, the matter of weather entered as a most important factor, and the very accurate information we obtained through your kindness was valuable, indeed, and we thank you for it.

BOSTON FORECAST DISTRICT.

The month was uneventful. The first killing frost of the season in the cranberry regions, which are chiefly confined to the coast sections of Massachusetts, was correctly forecast. This is the only portion of the district where frost warnings are of special importance or value.—*J. W. Smith, Forecast Official.*

NEW ORLEANS FORECAST DISTRICT.

The only storm of the month on the Gulf coast occurred at Galveston on the 8th. The official in charge at that station hoisted warnings in ample season. Timely warnings were issued twenty-four hours in advance of the general frost which occurred over the northeastern portion of this district on the morning of the 14th.—*I. M. Cline, Forecast Official.*

CHICAGO FORECAST DISTRICT.

The month was notably free from disastrous storms and dangerous winds. The only notable storm of the month crossed the upper lakes during the 12th and 13th, and storm warnings were displayed in advance of it.—*F. J. Walz, Forecast Official.*

DENVER FORECAST DISTRICT.

No special warnings were issued during October, 1901.—*F. H. Brandenberg, Forecast Official.*

SAN FRANCISCO FORECAST DISTRICT.

The month, as a whole, was a dry one; between the 4th and 24th but little rain fell. A heated spell occurred from the 10th to the 12th, the 11th being the warmest day of the year to date; the maximum reached 91.4° at San Francisco on the 12th. The rains of the 17th in the San Joaquin Valley and of the 24th and 25th generally over California were accurately forecast on the 16th and 23d, respectively.—*A. G. McAdie, Professor.*

PORTLAND, OREG., FORECAST DISTRICT.

The month was unusually warm and dry. No damaging frosts occurred west of the Cascade Mountains, but freezing temperatures and frosts were of frequent occurrence east of this range. The closing days of the month on the Washington coast were stormy, and reports obtained from incoming Alaska steamers were to the effect that the gales were unusually severe off the Alaska and British Columbia coasts. Marine interests were kept fully advised regarding the force and character of the storms, and no casualties of consequence occurred.—*Edward A. Beals, Forecast Official.*

HAVANA, CUBA, FORECAST DISTRICT.

Several disturbances of minor importance appeared in the West Indies during the month, concerning which marine interests were fully advised.—*William B. Stockman, Forecast Official.*

AREAS OF HIGH AND LOW PRESSURE.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.		°	°		°	°	*Miles.*	*Days.*	*Miles.*	*Miles.*
I	1, a. m.	50	120	2, a. m.	41	101	1,250	1.0	1,250	52.1
II	2, a. m.	51	114	7, p. m.	39	75	3,075	5.5	559	23.3
	4, p. m.	54	106				1,825	3.0	608	25.3
III	9, a. m.	49	86	11, a. m.	48	54	1,475	2.0	738	30.8
IV	12, a. m.	50	120	16, a. m.	39	80	2,900	4.0	725	30.2
V	14, a. m.	51	114	19, a. m.	34	78	3,150	5.0	630	26.2
VI	18, a. m.	51	117	20, p. m.	44	73	2,200	2.5	880	36.7
VII	22, p. m.	53	108	26, a. m.	34	78	2,150	3.5	614	25.6
VIII	24, a. m.	38	114	29, a. m.	45	67	2,625	5.0	525	21.9
	25, p. m.	53	108				2,225	3.5	636	26.5
IX	30, a. m.	43	123	†4, a. m.	47	65	3,350	5.0	670	27.9
Sums							26,225	40.0	7,835	326.5
Mean of 11 paths							2,384		712	29.7
Mean of 40.0 days									656	27.3
Low areas.										
I	*30, a. m.	41	105	4, a. m.	45	64	2,325	5.0	465	19.4
II	3, p. m.	50	110	6, a. m.	44	70	1,950	2.5	780	32.5
III	6, p. m.	38	105	9, p. m.	43	86	1,550	3.0	517	21.5
	8, a. m.	50	107				1,350	1.5	900	37.5
IV	10, a. m.	38	100	12, a. m.	49	90	1,050	2.0	525	21.9
	10, p. m.	51	114				1,175	1.5	783	32.6
V	11, a. m.	26	97	13, a. m.	47	85	1,775	2.0	888	37.0
				16, a. m.	48	54	3,175	5.0	635	26.5
VI	13, a. m.	54	114	19, a. m.	48	54	3,875	6.0	646	26.9
	16, p. m.	40	80				1,525	2.5	610	25.4
VII	16, p. m.	54	114	20, a. m.	46	60	2,575	3.5	736	30.7
VIII	23, p. m.	54	114	27, a. m.	47	65	2,350	3.5	671	28.0
IX	26, a. m.	38	123	28, p. m.	53	105	1,725	2.5	690	28.7
X	29, a. m.	54	114	†1, a. m.	48	69	2,100	3.0	700	29.2
Sums							28,500	43.5	9,546	397.8
Mean of 14 paths							2,036		682	28.4
Mean of 43.5 days									655	27.3

*September. †November.

For graphic presentation of the movements of these highs and lows see Charts I and II.—*H. C. Frankenfield, Forecast Official.*

RIVERS AND FLOODS.

Nothing of interest occurred along the various river systems during the month of October. Stages were generally lower, except in the upper Mississippi. During the last few days of the month the stage of the Ohio River was so low that boats could not proceed above Maysville, Ky. On the upper Tennessee navigation for the larger boats was suspended on the 24th.

No ice has as yet appeared in the rivers.

The highest and lowest water, mean stage, and monthly range at 134 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are: Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport on the Red.—*H. C. Frankenfield, Forecast Official.*

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following summaries relating to the general weather and crop conditions are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau.

[Temperature is expressed in degrees Fahrenheit and precipitation in inches and hundredths.]

Alabama.—The mean temperature was 62.7°, or 1.2° below normal; the highest was 92°, at Evergreen on the 1st, and the lowest, 31°, at Ashville and Valley Head on the 15th. The average precipitation was 1.04, or 1.65 below normal; the greatest monthly amount, 3.35, occurred at Camp Hill, and the least, 0.21, at Selma.

Conditions, as a whole, were generally favorable for maturing and harvesting staple crops, though slightly damaging frosts occurred in north-central counties on the morning of the 15th. Almost uninterrupted sunshine during the latter half of the month. Fall seeding backward, but well under way at the close of the month.—*F. P. Chaffee.*

Arizona.—The mean temperature was 67.0°, or 1.6° above normal; the highest was 107°, at Mohawk Summit on the 3d, and the lowest, 24°, at Prescott on the 29th. The average precipitation was 0.92, or 0.15 above normal; the greatest monthly amount, 2.56, occurred at Bisbee, while none fell at Aztec.

Late crops are maturing under favorable conditions in the San Pedro Valley, and the soil is in fair condition for seeding. In other agricultural districts farming operations are backward on account of deficient supply of water for irrigation, and little plowing or seeding has been done.—*Wm. G. Burns.*

Arkansas.—The mean temperature was 63.7°, or 1.2° above normal; the highest was 95°, at Oregon and Rison on the 1st and at Texarkana on the 2d, and the lowest, 27°, at Pond on the 14th. The average precipitation was 2.07, or 0.67 below normal; the greatest monthly amount, 5.03, occurred at Warren, and the least, 0.53, at Hardy.

The weather was generally favorable for cotton picking; this work progressed rapidly, and by the end of the month the bulk of the crop had been gathered. Many fields had been picked clean with the first picking; others had been gone over the second time, while still others had been picked over the third and last time. Very few of the young bolls had matured, and there was practically no top crop. Corn had all been gathered and housed, except some very late planted in a few localities in the northwest section, and that was maturing very slowly. The crop generally was very light, in some sections being a total failure. Although conditions were generally unfavorable for seeding and germination of fall grain, on account of the almost total absence of precipitation, considerable fall plowing and seeding had been done.—*Edward B. Richards.*

California.—The mean temperature was 63.2°, or 2.4° above normal; the highest was 112°, at Salton on the 19th, and the lowest, 10°, at Bodie on the 28th. The average precipitation was 1.50, or 0.32 above normal; the greatest monthly amount, 5.71, occurred at Auburn, while none fell at 6 stations.

Unusually high temperatures in the central coast district on the 10th, 11th, and 12th, and in Southern California on the 21st; crops were not injured. The heavy rains toward the close of the month slightly damaged grain, hay, and beans, but raisins were not injured, as ample warnings had been given. Fires damaged timber and grazing lands.—*Alexander G. McAdie.*

Colorado.—The mean temperature was 49.6°, or 2.6° above normal; the highest was 89°, at Lamar on the 1st, and the lowest, 5°, at Breckenridge on the 31st. The average precipitation was 0.60, or 0.51 below normal; the greatest monthly amount, 1.81, occurred at Ruby, while none fell at Hugo and Las Animas.

The weather conditions were ideal for the ripening and gathering of outstanding crops. In the few localities favored with rainfall a large acreage was plowed, but, as a rule, preparation for next year's crops is not as far advanced as usual, even though many fields were irrigated to facilitate the work. Lack of precipitation also materially interfered with seeding and germination. In localities the needed moisture was obtained by irrigation, but over large areas the grain is not yet up, and the condition of wheat and rye, as a whole, is below the average. At the close of the month potato digging was still under way, and, owing to a decided increase in the acreage and a scarcity of help, two-thirds of the sugar-beet crop was still in the field.—*F. H. Brandenburg.*

Cuba.—The mean temperature was 78.2°, or about normal; the highest was 96°, at San Cayetano on the 1st, and the lowest, 60°, at San Cayetano on the 15th and Santa Clara on the 9th. The average precipitation was 8.04; the greatest monthly amount, 20.81, occurred at Soledad (Guantanamo), while none fell at Providencia (Guines).

The temperature decreased gradually throughout October and conformed quite closely with normal October weather. Along the southern coast from Manzanillo westward rainfall was comparatively light. In the Guantanamo and Santiago de Cuba districts it was exceptionally heavy, the monthly fall at some places exceeding 20 inches, the greater portion of which occurred during the prevalence of the barometric depression that dominated the weather of the eastern end of the island from the 13th to the 15th (at Guantanamo 17.84 inches fell within twenty-four hours on the 14–15th). In Pinar Del Rio during the latter half of month good progress was made with tobacco transplanting, the weather admitting of field work and also being favorable for the growth of seed beds. In northern Santa Clara the frequent rains were very injurious to seed beds and rendered the preparation of tobacco lands impracticable. In other tobacco sections crop preparations and seed beds were favored by the weather during the greater part of the month. Canes made good advancement, both new plantings and the maturing crop. In northern Santa Clara, however, field work was greatly interrupted by rains, and lowland canes were injuriously affected, to a varying extent, by an excess of moisture.—*W. B. Stockman.*

Florida.—The mean temperature was 72.2°, or 1.0° below normal; the highest was 94°, at Sumner on the 1st, Nocatee on the 12–13th, and at Fort Meade on the 13th, and the lowest, 39°, at Wausau on the 15th. The average precipitation was 1.85, or 2.41 below normal; the greatest monthly amount, 7.08, occurred at Jupiter, and the least, trace, at Quincy and Waukeenah.

The month was the driest October on record. Cotton picking advanced rapidly and conditions were favorable for harvesting corn and minor crops. Cane and sweet potatoes did fairly well. Citrus fruits colored rapidly. Pineapples made good progress. At the close of the month rain was needed over all sections except portions of the southeast coast.—*F. G. Tingley.*

Georgia.—The mean temperature was 63.0°, or 1.1° below normal; the highest was 92°, at Fitzgerald, Mauzy, and Waycross on the 1st, and the lowest, 32°, at Ramsey on the 15th. The average precipitation was 1.07, or 1.40 below normal; the greatest monthly amount, 4.08, occurred at Waycross, and the least, trace, at Naylor.

The weather of the month was ideal, the leading features being the very light precipitation, the large number of clear days and abundant sunshine, and the generally uniform temperature. There were but three cloudy days and three days with rain. These conditions were eminently satisfactory for crop interests, and harvesting was brought to a close with hardly the loss of a single day's work. The only detrimental factor in the weather was in connection with fall plowing and seeding, which could not be successfully prosecuted owing to the dryness of the soil. Cotton made a decided improvement and the bulk of the crop was saved in excellent condition.—*J. B. Marbury.*

Idaho.—The mean temperature was 51.0°, or 4.3° above normal; the highest was 90°, at Garnet and Fayette on the 2d, and the lowest, 10°, at Chesterfield on the 18th. The average precipitation was 0.96, or 0.60 below normal; the greatest monthly amount, 2.03, occurred at Albion, and the least, 0.12, at Downey.

Unusually high temperature prevailed, and the mean temperature for the State was 2.4° higher than the highest mean temperature heretofore recorded for October. There was a large deficiency of precipitation, and an unusually large number of clear days. No storms of importance occurred, but on the 29th a brisk to high wind extended to all parts of the State. A rather severe earthquake shock occurred at Paris, Idaho, on the 23d. The weather conditions were especially favorable for active seeding of wheat, fruit tree planting, and placer mining.—*S. M. Blandford.*

Illinois.—The mean temperature was 56.8°, or 1.8° above normal; the highest was 92°, at Centralia, Cobden, and Greenville on the 1st, and the lowest, 21°, at Streator on the 18th. The average precipitation was 1.96, or 0.34 below normal; the greatest monthly amount, 5.45, occurred at Raum, and the least, 0.61, at Antioch.

The weather of October was very favorable for fall farm work. Corn matured quite rapidly, and almost the entire crop was ready for husking by the end of the month. The dry weather which prevailed during the greater part of the month caused the ground to become hard and difficult to plow in many places. Fall seeded grain has done fairly well. The good rains which occurred shortly before the middle of the month were of great benefit to early sown grain, but the weather has been too dry since that time for the proper germination and growth of late sown grain.—*M. E. Blystone.*

Indiana.—The mean temperature was 55.8°, or 1.2° above normal; the highest was 90°, at Prairie Creek on the 1st, and the lowest, 22°, at Winamac on the 5th. The average precipitation was 3.34 or 0.86 above normal; the greatest monthly amount, 7.08, occurred at Topeka, and the least, 0.60, at Vevay.

The month was unusually favorable for farming interests. Between the 3d and 5th nearly all stations reported frost, and many reported temperatures below freezing, and during the 17th and 18th a moderate cold wave passed over the State, producing temperatures below freez-

ing in practically all sections. At the end of the month, corn husking was well advanced; wheat had nearly all been sown, and most of it was up and looking well; apples were nearly all gathered and fall pastures were good.—*W. T. Blythe.*

Iowa.—The mean temperature was 54.2°, or 4.0° above normal; the highest was 88°, at Elkader on the 23d, and the lowest, 20°, at Dows on the 3d. The average precipitation was 1.98, or 0.30 below normal; the greatest monthly amount, 4.23, occurred at Thurman, and the least, 0.45, at Davenport.

The month was warm, and, except in portions of the southeastern and eastern counties, the moisture was ample for germination and growth of fall grain and to facilitate fall plowing. The latter half of the month was very favorable for cribbing corn, plowing, and general farm operations. Pastures made good growth, and, except in limited dry area, fall grain made vigorous growth during the month.—*John R. Sage.*

Kansas.—The mean temperature was 60.1°, or 5.3° above normal; the highest was 97°, at Moran on the 6th, and the lowest, 21°, at Achilles on the 17th. The average precipitation was 1.93, or 0.11 above normal; the greatest monthly amount, 6.30, occurred at Hutchinson, while none fell at Scott and only a trace at Lebanon.

Warm, fine weather, specially valuable for maturing and gathering forage crops, for pastures, and for growing wheat and rye. Some late corn, kaffir, and sorghum were injured by frost. Large acreage of wheat sown, mostly up and growing well; some being pastured. Apples large crop, good quality. Alfalfa has yielded well, the fifth crop being gathered in some counties. Some damage to sugar beets by hail in Hamilton County.—*T. B. Jennings.*

Kentucky.—The mean temperature was 58.1°, or 0.8° below normal; the highest was 93°, at Greensburg on the 11th, and the lowest, 25°, at Loretto on the 18th. The average precipitation was 1.57, or 0.53 below normal; the greatest monthly amount, 6.05, occurred at Paducah, and the least, 0.19, at Catlettsburg.

The dry, moderately warm weather during the month was very favorable for securing late crops. The lack of rainfall interfered with wheat sowing in some localities; that sown earlier made fair advancement, but generally needed more rain. Tobacco cured nicely and fall grazing was good. Corn shucking nearly completed, yield poorer than anticipated. Farm work well up.—*H. B. Hersey.*

Louisiana.—The mean temperature was 67.1°, or 0.5° below normal; the highest was 96°, at Minden on the 2d, and the lowest, 35°, at Plain Dealing and Robeline on the 14th. The average precipitation was 2.29, or 0.77 below normal; the greatest monthly amount, 5.19, occurred at Covington, and the least, 0.65, at Cheneyville.

With the exception of showery weather during the early part of the second decade, the weather throughout the month was exceptionally favorable for cotton picking. Frost occurred over the northern and central portions of the State toward the close of the second decade and damaged cotton to some extent. Picking was pushed vigorously, and in many places was about completed at the close of the month. Labor was scarce in a few localities. Reports from some localities state that the yield was about the average or better than anticipated. The crop as a whole was below the average, and in some places was very light. The weather has been admirably suited to the development of the sugar cane crop. Grinding commenced about the middle of the month, and was soon general. The yield, both in tonnage and sugar content, was reported satisfactory. Rice was generally housed in good condition. The crop was, as a rule, good. Corn gathering made good progress. The yield, while about an average in some localities, was generally below the average, and was very light in some places.—*I. M. Cline.*

Maryland and Delaware.—The mean temperature was 54.9°, or 0.9° below normal; the highest was 92°, at McDonough, Md., on the 13th, and the lowest, 16°, at Deer Park, Md., on the 24th. The average precipitation was 1.14, or 1.88 below normal; the greatest monthly amount, 2.27, occurred at Milford, Del., and the least, 0.21, at Bœttcherville, Md.

The dry, open weather was extremely favorable for the completion of the corn harvest and for the seeding of winter grain, but the large deficiency in moisture was greatly against the proper germination of wheat. Early sown wheat received enough rain to bring it to a good stand, but late sown had not sprouted to any extent at the close of the month. Grass suffered some for want of rain, but pasturage was good in most districts. The corn crop is a large one, and is saved in fine condition. Husking advanced slowly during the month.—*Oliver L. Fassig.*

Michigan.—The mean temperature was 49.6°, or about normal; the highest was 86°, at Cheboygan and Mio on 30th and at South Haven on 31st, and the lowest, 7°, at Humboldt on the 18th. The average precipitation was 3.24, or 0.42 above normal; the greatest monthly amount, 7.77, occurred at Whitefish Point, and the least, 0.70, at Birmingham.

The weather conditions during October were generally very favorable to field operations, and in most counties sufficient rain had fallen to nicely germinate winter wheat and rye. Corn husking and potato digging advanced rapidly during the entire month; corn and sugar beets were generally very good crops, but late potato yields were only fair. Farmers as a rule have been sowing their wheat and rye much later than usual, and consequently very little complaint of the hessian fly had been heard at the close of the month, because wheat had hardly advanced far enough to enable the fly to begin its work.—*C. F. Schneider.*

Minnesota.—The mean temperature was 49.2°, or 3.0° above normal; the highest was 86°, at Willow River on the 21st, and the lowest, 13°, at Pokegama Falls on the 27th. The average precipitation was 1.86, or 0.50 below normal; the greatest monthly amount, 9.56, occurred at Bemidji, and the least, 0.35, at Blooming Prairie.

Corn husking and shredding progressed rapidly during the favorable weather. The fall sown rye and wheat in the small areas in which they are seeded were doing well. Hardy vegetation continued green in the south all through the month.—*T. S. Outram.*

Mississippi.—The mean temperature was 64.4°, or 0.3° below normal; the highest was 93°, at Jackson on the 2d, and the lowest, 30°, at Aberdeen on the 15th. The average precipitation was 1.55, or 0.78 below normal; the greatest monthly amount, 3.85, occurred at Brookhaven, and the least, 0.15, at Okolona.

The weather during the month was very favorable for gathering crops. The rainfall nearly all occurred from the 8th to the 12th, inclusive, and did but little damage to open cotton. Several light frosts were observed over the northern and central counties from the 14th to the 19th, but did slight injury to vegetation. Cotton picking advanced rapidly, and at the close of the month the crop was about three-fourths picked. The yield was very light in the northern part of the State, but fair south, with about an average crop in some of the southwestern counties. Corn gathering was about completed, with a light yield, although sufficient for home consumption in many counties. Fall crops were generally yielding well.—*W. S. Belden.*

Missouri.—The mean temperature was 60.0°, or 2.9° above normal; the highest was 96°, at Appleton City on the 1st, and the lowest, 24°, at Ironton on the 5th. The average precipitation was 1.67, or 0.82 below normal; the greatest monthly amount, 3.93, occurred at Rockport, and the least, 0.47, at Willow Springs.

The month was exceptionally pleasant throughout the State and favorable for the gathering of outstanding crops, but in most sections grasses and fall sown grains suffered more or less from lack of moisture. In some of the southeastern counties wheat sowing could not be completed on account of the drought, and some wheat that had sprouted died. Pastures continued very short in the central and eastern sections and there was a general scarcity of stock water.—*A. E. Hackett.*

Montana.—The mean temperature was 48.9°, or 4.9° above normal; the highest was 80°, at Lewistown on the 19th, and the lowest, 15°, at Yale on the 31st. The average precipitation was 0.35, or 0.69 below normal; the greatest monthly amount, 2.00, occurred at Corvallis, while none fell at Deer Lodge and Martinsdale.

The mean monthly temperature was the highest on record at the greater number of stations throughout the State and the precipitation was the least on record.—*E. J. Glass.*

Nebraska.—The mean temperature was 54.0°, or 3.5° above normal; the highest was 88°, at Culbertson on the 12th and 14th, Beaver City on the 18th, and Dawson on the 22d, and the lowest, 20°, at Tecumseh on the 14th, Red Cloud on the 17th, and Camp Clark on the 31st. The average precipitation was 1.64, or 0.08 above normal; the greatest monthly amount, 4.04, occurred at Strang, while none fell at Wallace.

Very favorable month for plowing and seeding, also for germination and growth of fall sown grain. An unusually large acreage of winter wheat has been sown and the entire crop is in fine condition. Corn husking progressed slowly, because the heavy rain in September and the first of October kept the corn too moist for cribbing. Corn seems to be yielding better than had been expected, but the grain is of poor quality.—*G. A. Loveland.*

Nevada.—The mean temperature was 50.7°, or 2.1° above normal; the highest was 90°, at Candelaria on the 15th, and the lowest, 17°, at Hamilton on the 31st. The average precipitation was 1.11, or 0.58 above normal; the greatest monthly amount, 2.22, occurred at Lewers Ranch, while none fell at Halleck and Hawthorne.

The weather during the greater part of the month was fine and pleasant, and very favorable for gathering late crops and for fall plowing. The range feed throughout the State was fairly good and livestock was in good condition.—*J. H. Smith.*

New England.—The mean temperature was 49.8°, or 1.7° above normal; the highest was 82°, at Provincetown, Mass., on the 13th and the lowest, 15°, at Jacksonville, Vt., on the 28th and Grafton, N. H., on the 29th. The average precipitation was 2.98, or 0.64 below normal; the greatest monthly amount, 6.55, occurred at Mount Tom, Mass., and the least, 0.44, at Nantuckett, Mass.

The weather of the month was exceptionally pleasant, there being seventeen clear days. The fair weather was very favorable to farm operations and outdoor work generally. Crops harvested in good condition; little damage from frost.—*J. W. Smith.*

New Jersey.—The mean temperature was 54.4°, or 0.5° above normal; the highest was 82°, at Indian Mills on the 10th and at Bridgeton on the 23d, and the lowest, 21°, at Layton on the 26th. The average precipitation was 1.93, or 1.75 below normal; the greatest monthly amount, 4.45, occurred at River Vale and the least, 0.87, at Cape May.

All farming operations well advanced; fall seeding completed and that sown early is up and growing nicely. First killing frost did not occur until the 26th, too late to do any damage, as all crops were safely housed prior to that date.—*E. W. McGann.*

New Mexico.—The mean temperature was 55.8°, or 1.4° above normal; the highest was 99°, at Carlsbad on the 2d, and the lowest, 22°, at Blue-

water on the 15th. The average precipitation was 1.57, or 0.30 above normal; the greatest monthly amount, 3.15, occurred at Strauss, while none fell at Raton.

Late fall crops harvested under favorable conditions. Grass well cured and prairies well watered, insuring good fall and winter feed for stock.—*R. M. Hardinge.*

New York.—The mean temperature was 49.7°, or about normal; the highest was 79°, at New Rochelle on the 4th, Catskill on the 23d, and Appleton on the 30th, and the lowest, 17°, at New Lisbon on the 26th and Axton on the 29th. The average precipitation was 2.03, or 0.43 below normal; the greatest monthly amount, 5.24, occurred at Southeast Reservoir, and the least, 0.59, at Romulus.

The month was very favorable for farm operations, all crops having been saved without material damage from frost; heavy snow fell in parts of the northern portion on the 18th; wheat and rye were seeded later than usual, and dry weather prevented quick germination, but the early planted winter grain is very promising; considerable rotting of potatoes was reported.—*R. G. Allen.*

North Carolina.—The mean temperature was 58.9°, or 0.2° above normal; the highest was 90°, at Tarboro on the 2d, and the lowest, 24°, at Linville on the 5th. The average precipitation was 1.63, or 2.06 below normal; the greatest monthly amount, 3.80, occurred at Southport, and the least, trace, at Salisbury.

The weather was generally very favorable for gathering crops, but the drought during the last half of the month rather interfered with plowing and seeding winter crops. A good deal of top cotton opened during the favorable weather and picking made rapid progress. The yield of both cotton and corn proved far less than expected. A good rain is now needed to start the growth of winter wheat. The damage by frost was small.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 47.5°, or 5.5° above normal; the highest was 88°, at University on the 22d, and the lowest, 11°, at Cando on the 31st. The average precipitation was 1.61, or 0.42 above normal; the greatest monthly amount, 3.83, occurred at Fargo, and the least, trace, at Willow City.

The precipitation was considerably in excess of the usual amount in the eastern portion of the State, where the bulk of the wheat crop is grown, and interfered very seriously with thrashing, which was in progress there. Considerable grain was damaged by rain while in the stack, and, taken altogether, the weather was generally unfavorable for farm work, except for about ten days toward the close of the month.—*B. H. Bronson.*

Ohio.—The mean temperature was 53.8°, or 1.2° above normal; the highest was 88°, at Lima on the 29th, and the lowest, 20°, at Coalton on the 18th. The average precipitation was 0.73, or 1.33 below normal; the greatest monthly amount, 4.09, occurred at Montpelier, and the least, trace, at Cambridge, Demos, and Thurman.

The temperature was generally above normal. Cool weather prevailed from the 3d to 7th and from the 14th to 18th; freezing temperature occurring all over the State on the 18th. There was a marked deficiency in precipitation. In the southeast many wells are dry and stock water scarce, with pastures in poor condition. Corn became very dry the last of the month. Much wheat was sown during the month, but germination was much retarded by the drought. Hessian fly has attacked the early sown in some central and southern counties. Potatoes were practically uninjured by the cold weather; apples secured in good condition with light crop.—*J. Warren Smith.*

Oklahoma and Indian Territories.—The mean temperature was 65.4°, or 2.5° above normal; the highest was 99°, at Webber Falls, Ind. T., on the 1st, and the lowest, 27°, at Blackburn, Ind. T., on the 14th. The average precipitation was 1.99, or 0.66 below normal; the greatest monthly amount, 4.75, occurred at Holdenville, Ind. T., and the least, 0.28, at Arapaho, Okla.

Weather favorable during month for seeding wheat and picking cotton. Wheat about sown and up to good stand, with early sown being pastured; the crop needs rain to place it in condition to withstand the winter season. Cotton about two-thirds picked. Rye and oats sown doing well. Stock in fair condition, but water scarce.—*Charles M. Strong.*

Oregon.—The mean temperature was 56.4°, or 4.7° above normal; the highest was 92°, at Toledo on the 13th, and the lowest, 18°, at Vale on the 31st. The average precipitation was 1.60, or 1.36 below normal; the greatest monthly amount, 6.20, occurred at Nehalem, and the least, trace, at Blalock and Umatilla.

The weather during the month was exceptionally favorable for farm work in general, especially fall plowing and seeding. Winter wheat, oats, and rye germinated nicely, and an excellent stand is reported from all sections in the State. Range grass and pastures maintained a satisfactory growth throughout the month. Winter apples matured well and some picking was done; the crop is below the average.—*Edward A. Beals.*

Pennsylvania.—The mean temperature was 52.2°, or 1.2° above normal; the highest was 83°, at California on the 11th, and the lowest, 20°, at Center Hall on the 7th, Grampian on the 22d, and Somerset on the 24th. The average precipitation was 1.23, or 2.05 below normal; the greatest monthly amount, 3.35, occurred at Pocono Lake, and the least, 0.23, at Elwood Junction.

The month was exceptionally favorable for the maturing and harvesting of late crops, the completion of fall seeding, and general farm work. On account of rot potatoes were a partial failure in most sections, otherwise good yields were obtained from all staple crops and most of the minor ones. In a few localities the soil was too dry for plowing and the germination of late seeding. Early sown grain had a good stand and a satisfactory start. The damage to crops by frost was very slight.—*T. F. Townsend.*

Porto Rico.—The mean temperature was 79.2°, or 0.8 above normal; the highest was 96°, at Cayey on the 8th and at Fajardo on the 9th, and the lowest, 59°, at Adjuntas on the 22d. The average precipitation was 11.46, or 2.03 above normal; the greatest monthly amount, 19.84, occurred at Isolena, and the least, 3.36, at Yauco.

The rainfall for the month was quite general and decidedly above the normal, except during the second decade. The excessive rains seriously retarded field work especially toward the close of the month, and caused some loss of rice and damage to tobacco seed beds and smaller crops. The growing crops of cane, corn, and rice, made satisfactory progress, while the gathering of the coffee crop was carried on with activity. All maturing crops are giving good yield. The new orange crop is being marketed. There was a scarcity in some portions of the island of a few of the minor fruits and small crops such as plantains, beans, sweet potatoes, etc.—*E. C. Thompson.*

South Carolina.—The mean temperature was 62.4°, or 1.6° below normal; the highest was 92°, at Seivern on the 1st, and the lowest, 29°, at Seivern on the 19th. The average precipitation was 0.89, or 2.33 below normal; the greatest monthly amount, 2.86, occurred at Trenton, and the least, trace, at Georgetown.

Extremely favorable weather for gathering ripe crops, but generally too dry for plowing and for seeding oats. Oats sown early in the month came up to good stands; those sown after the 15th failed to germinate well. Cotton picking progressed rapidly, and was nearly finished over the eastern counties, but much remains to pick and to open over the western counties. Frost was general from the 16th to the 19th, generally light, but heavy to killing over the south-central counties.—*J. W. Bauer.*

South Dakota.—The mean temperature was 52.0°, or 4.0° above normal; the highest was 89°, at Leola on the 21st, and the lowest, 15°, at Ashcroft on the 3d. The average precipitation was 1.71 or 0.64 above normal; the greatest monthly amount, 4.70, occurred at Oelrichs, and the least, 0.49, at Cherry Creek.

Fall plowing and the seeding, germination, and growth of winter rye progressed very satisfactorily. At the close of the month thrashing was nearing completion; corn picking was general, with probably one-fourth of the corn in crib; plowing was unusually advanced; winter rye showed fine stand and was in excellent condition; fall pasturage was good, and live stock was generally in good condition.—*S. W. Glenn.*

Tennessee.—The mean temperature was 58.7°, or 0.2° below normal; the highest was 92°, at Dyersburg on the 2d, and the lowest, 25°, at Rugby on the 15th. The average precipitation was 1.53, or 0.92 below normal; the greatest monthly amount, 3.55, occurred at Dyersburg, and the least, 0.47, at Kingston.

Exceptionally favorable weather prevailed throughout the month and farm work was much further advanced than usual. Tobacco was housed in fine condition; cotton opened well and picking was kept up; the gathering of corn was in full progress; seeding of winter grains progressed favorably and seed was well put in; early sown wheat was up and growing well; immense forage crops were housed. The light frosts of the month were not injurious.—*H. C. Bate.*

Texas.—The mean temperature was 70.2°, or 2.0° above normal; the highest was 101°, at Fort McIntosh on the 12th, and the lowest, 32°, at Anna on the 14th. The average precipitation was 1.69, or 0.62 below normal; the greatest monthly amount, 15.00, occurred at Galveston, while none fell at Cotulla, Fort Clark, Fort McIntosh, Menardville, and Rockport.

Conditions were generally favorable during the month for securing crops, but in many sections the ground was too dry for sowing of grain. A drought of considerable severity prevailed over the greater portion of the western half of the State. Cotton picking at the close of the month was practically completed, except on bottom lands. Rice harvesting and cane cutting and grinding made rapid progress. Gardens and truck backward and in need of moisture.—*Edward H. Bowie.*

Utah.—The mean temperature was 51.7°, or 3.8° below normal; the highest was 93°, at St. George on the 2d, and the lowest, 5°, at Woodruff on the 22d. The average precipitation was 1.04, or 0.20 above normal; the greatest monthly amount, 2.81, occurred at Corinne, while none fell at Cisco.

It was probably the warmest October since 1876. Potato digging was completed, but sugar beet digging was still in active progress at the close of the month. The general rains during the last week caused fall sown grain to germinate nicely.—*L. H. Murdoch.*

Virginia.—The mean temperature was 56.5°, or about normal; the highest was 88°, at Barboursville on the 11th, and the lowest, 21°, at Burkes Garden on the 5th. The average precipitation was 1.19, or 2.12 below normal; the greatest monthly amount, 3.15, occurred at Williamsburg, and the least, 0.10, at Farmville and Manassas.

The weather was generally bright and beautiful throughout the

month, and the growth of crops very good. Owing, however, to the lack of rain, the soil became hard and refractory, delaying fall plowing and other preparation for late seeding, and retarding germination of recently seeded fields of wheat and oats.—*Edward A. Evans.*

Washington.—The mean temperature was 54.8°, or 5.3° above normal; the highest was 87°, at Pasco on the 20th, and the lowest, 21°, at Northport on the 13th. The average precipitation was 2.12, or 0.68 below normal; the greatest monthly amount, 10.71, occurred at Clearwater, while none fell at Pasco.

The phenomenally warm and pleasant weather was very favorable for plowing, thrashing, and gathering fall crops. The yield of oats was large, and the wheat yield heavy beyond expectations. The potato and apple crops were short. September sown wheat made good growth, but October sown did not germinate well until the close of the month. Pastures were greatly improved by the rain that fell during the last week, and the condition of the soil was greatly improved.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 54.3°, or 0.7° below normal; the highest was 86°, at Powellton on the 1st, and the lowest, 19°, at Philippi on the 25th. The average precipitation was 0.54, or 1.68 below normal; the greatest monthly amount, 1.60, occurred at Princeton, and the least, 0.12, at Dayton.

The clear, dry weather, with cool nights and warm days, was favorable for farm work of all kinds, which was well up to date at the close of the month. Corn cutting progressed well and some corn was husked, although it was rather too dry for this work. Apples had all been gathered with below average yield, except in the panhandle section, where an average crop of good quality was raised. Pastures were short and dried up, but stock was doing fairly well. Water in streams, and in wells in some cases, was getting scarce. Plowing for wheat was mostly completed, and wheat was about all sown, but was not germinating very well on account of lack of moisture.—*E. C. Vose.*

Wisconsin.—The mean temperature was 50.7°, or 2.5° above normal; the highest was 86°, at Racine on the 1st, and the lowest, 12°, at North Crandon on the 28th. The average precipitation was 2.60, or 0.24 above normal; the greatest monthly amount, 5.49 occurred at Menasha, and the least, 0.65, at Milwaukee.

The month was mild and equable throughout, and favorable for the completion of fall work. Plowing, husking, and potato digging were generally completed by the end of the month. The rains during the second week were very beneficial to fall grains and pastures. Winter wheat and rye made good growth and are now generally in good condition.—*W. M. Wilson.*

Wyoming.—The mean temperature was 47.6°, or 2.9° above normal; the highest was 86°, at Bitter Creek on the 5th, and the lowest, 10°, at Daniel on the 31st. The average precipitation was 0.76, or 0.04 below normal; the greatest monthly amount, 1.82, occurred at Evanston, and the least, 0.05, at Hyattville.

The month was unusually favorable for stock, and special reports from correspondents indicate that in nearly every section the outlook for the winter is exceptionally bright. The range feed is better than the average, stock now in first-class condition, and the supply of hay on hand is probably greater than ever before in the history of the State.—*W. S. Palmer.*

SPECIAL CONTRIBUTIONS.

CLIMATOLOGY OF COSTA RICA.

Communicated by H. PITTIER, Director, Physical Geographic Institute.

TABLE 1.—*Hourly observations at the Observatory, San Jose de Costa Rica, during October*, 1901.

Hours.	Pressure.		Temperature.		Relative humidity.		Rainfall.		
	Observed, 1901.	Normal, 1889–1900.	Observed, 1901.	Normal, 1889–1900.	Observed, 1901.	Normal, 1889–1900.	Observed, 1901.	Normal, 1889–1900.	Duration, 1901.
	660+ *Mm.*	660+ *Mm.*	°*C.*	°*C.*	%	%	*Mm.*	*Mm.*	*Hrs.*
1 a. m.	3.47	3.14	17.19	17.31	94	95	2.0	4.2	2.17
2 a. m.	3.22	2.74	16.96	17.18	94	95	0.7	3.7	2.00
3 a. m.	3.06	2.56	16.73	16.93	95	95	0.5	3.2	1.17
4 a. m.	3.02	2.59	16.60	16.82	94	95	0.4	2.3	2.09
5 a. m.	3.12	2.86	16.33	16.65	95	95	0.3	1.8	1.50
6 a. m.	3.46	3.29	16.50	16.61	94	94	0.1	1.6	0.50
7 a. m.	3.81	3.66	17.84	17.81	89	90	0.0	2.0	0.00
8 a. m.	4.07	3.89	19.55	19.52	82	83	1.9	1.8	1.00
9 a. m.	4.35	4.16	22.02	21.73	72	76	0.2	0.8	0.67
10 a. m.	4.36	4.14	23.85	23.54	67	71	0.0	0.5	0.00
11 a. m.	3.97	3.72	24.61	24.48	66	70	0.1	0.8	0.33
12 m.	3.34	3.16	24.67	24.53	67	71	0.9	2.8	1.00
1 p. m.	2.71	2.53	24.16	24.13	70	72	6.8	6.9	1.50
2 p. m.	2.30	2.11	22.94	23.26	74	76	36.4	18.9	4.11
3 p. m.	2.12	1.82	21.73	21.95	80	81	89.9	35.9	8.67
4 p. m.	2.26	2.03	20.75	20.70	84	86	66.4	42.1	10.08
5 p. m.	2.58	2.33	19.65	19.80	87	88	99.5	56.5	10.76
6 p. m.	3.01	2.76	19.80	19.10	92	92	79.5	49.5	14.24
7 p. m.	3.47	3.34	18.63	18.67	93	93	38.7	47.0	12.99
8 p. m.	3.79	3.73	18.44	18.43	93	93	16.9	24.3	10.66
9 p. m.	4.15	3.92	18.27	18.22	93	94	12.7	15.4	6.84
10 p. m.	4.21	4.06	18.00	17.98	93	94	11.9	12.0	6.42
11 p. m.	4.16	3.91	17.79	17.59	93	94	6.8	8.8	5.00
Midnight	3.85	3.57	17.41	17.54	94	95	5.3	5.9	4.83
Mean	663.42	663.17	19.56	19.61	86	91	.....	.....	.....
Minimum	660.60	659.63	14.5	13.4	55	.....	.....	.....	.....
Maximum	665.90	666.12	28.7	29.3	100	.....	21.6	.....	.....
Total	.....	.....	.....	.....	.....	.....	478.0	347.2	108.53

REMARKS.—The barometer is 1,169 meters above sea level. Readings are corrected for gravity, temperature, and instrumental error. The dry and wet bulb thermometers are 1.5 meters above ground and corrected for instrumental errors. The hourly readings for pressure, wet and dry bulb thermometers, are obtained by means of Richard registering instruments, checked by direct observations every three hours from 7 a. m. to 10 p. m. The hourly rainfall is as given by Hottinger's self-registering, checked once a day. Under maximum, the greatest hourly rainfall for the month is given. The standard rain gage is 1.5 meters above ground. In the Costa Rican system the San Jose local time is used, which is 0h 36m 13.3s slower than seventy-fifth meridian time.

TABLE 2.

Time.	Sunshine.		Temperature of the soil at depth of—					Cloudiness observed, 1901.
	Observed, 1901.	Normal, 1889–1900.	0.15 *m.*	0.30 *m.*	0.60 *m.*	1.20 *m.*	3.00 *m.*	
	Hours.	*Hours.*	°*C.*	°*C.*	°*C.*	°*C.*	°*C.*	%
7 a. m.	7.65	6.01	21.46	21.43	22.06	21.90	21.57	63
8 a. m.	15.59	17.68	.....	.....	.....	.....	.....	.....
9 a. m.	20.92	20.99	.....	.....	.....	.....	.....	.....
10 a. m.	20.32	20.90	21.47	21.48	22.10	21.93	.....	70
11 a. m.	17.15	18.58	.....	.....	.....	.....	.....	.....
12 m.	14.59	14.09	.....	.....	.....	.....	.....	.....
1 p. m.	7.14	11.39	21.88	21.66	22.12	21.91	.....	84
2 p. m.	8.66	10.87	.....	.....	.....	.....	.....	.....
3 p. m.	5.49	8.35	.....	.....	.....	.....	.....	.....
4 p. m.	3.76	4.73	21.86	21.68	22.04	21.87	.....	94
5 p. m.	1.58	1.85	.....	.....	.....	.....	.....	.....
6 p. m.	0.17	0.22	.....	.....	.....	.....	.....	.....
7 p. m.	.....	.....	21.75	21.67	22.05	21.86	.....	88
8 p. m.	.....	.....	.....	.....	.....	.....	.....	.....
9 p. m.	.....	.....	.....	.....	.....	.....	.....	.....
10 p. m.	.....	.....	21.62	21.64	22.04	21.86	.....	73
11 p. m.	.....	.....	.....	.....	.....	.....	.....	.....
Midnight	.....	.....	.....	.....	.....	.....	.....	.....
Mean	.....	.....	21.63	21.63	22.05	21.87	21.57	77
Total	123.02	135.65	.....	.....	.....	.....	.....	.....

Notes on the weather.—Rains have been rather excessive on the Pacific slope and in the mountains of the central range. On the Atlantic coast belt the remarkable drought which has prevailed through several months seems to have come to an end. At San Jose there was a short period of summer (*verano*) from the 8th to the 14th, with only occasional showers and fresh northeasterly breezes.

Earthquakes at San Jose.—October 1, 11h 20m 42s a. m., slight shock, NNW–SSE, intensity II, duration 6 seconds; 8h 50m p. m., slight shock, NNW–SSE, intensity II, duration 12 seconds. October 2, 2h 49m 11s a. m., very light tremors, apparently NNW–SSE, intensity I, duration 6 seconds. October 3, 6h 28m 40s a. m., light shock, W–E, intensity I, duration inappreciable. October 7, 8h 12m 0s p. m., light shock, NNW–SSE, intensity I, duration 4 seconds; 8h 26m 33s p. m., strong and prolonged shock, NNW–SSE, intensity III, duration 21 seconds; 8h 27m 30s p. m., strong shock, NNW–SSE, intensity IV, duration 12 seconds; 8h 33m 27s p. m., slight shock, NNW–SSE, intensity II, duration 6 seconds. October 14, 10h 30m a. m., slight shock, NNE–SSW, intensity II, dura-

tion 5 seconds; 9h 30m p. m., light shock, NNW–SSE, intensity II, duration 5 seconds. October 25, 11h 25m p. m., slight but prolonged tremors, NNW–SSE, intensity II, duration 32 seconds. October 31, 6h 30m p. m., very slight tremors.

TABLE 3.—*Rainfall at stations in Costa Rica, October*, 1901.

Stations.	Amount.	No. rainy days.	Stations.	Amount.	No. rainy days.
	Mm.			*Mm.*	
1. Sipurio (Talamanca)	.....	.....	14. Juan Vinas	359	19
2. Boca Banano	271	18	15. Santiago	256	25
3. Limon	163	16	16 Paraiso	226	20
4. Swamp Mouth	207	16	17. Las Concavas	366	18
5. Zent	146	16	18. Cartago	316	22
6. Gute Hoffnung	194	8	19. Tres Rios	316	22
7. Siquirres	404	16	20. S. Francisco G	464	22
8. Guapiles	489	21	21. San Jose	478	28
9. Sarapiqui	801	30	22. La Verbena	720	26
10. San Carlos	561	26	23. Nuestro Amo	325	25
11. Las Lomas	449	24	24. Alajuela	351	23
12. Peralta	498	27	25. San Isidro Alajuela	698	26
13. Turrialba	.....	.....			

HAWAIIAN CLIMATOLOGICAL DATA.

By CURTIS J. LYONS, Territorial Meteorologist.

Meteorological observations at Honolulu, October, 1901.

The station is at 21° 18′ N., 157° 50′ W.

Hawaiian standard time is 10h 30m slow of Greenwich time. Honolulu local mean time is 10h 31m slow of Greenwich.

Pressure is corrected for temperature and reduced to sea level, and the gravity correction, —0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.

The rainfall for twenty-four hours is measured at 9 a. m. local, or 7.31 p. m., Greenwich time, on the respective dates.

The rain gage, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet, and the barometer 50 feet above sea level.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m., Greenwich time, or 2.29 a. m., Honolulu time.									Total rainfall at 9 a. m., local time.
				Temperature.		Means.		Wind.		Average cloudiness.	Sea-level pressures.		
		Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.		Maximum.	Minimum.	
	*	†	†			‡	‡		§				
1	29.85	72	71	83	67	68.0	77	sw-w.	1	2	29.92	29.84	0.18
2	29.89	73	72.3	80	71	71.7	88	s-ne.	1-0	10	29.91	29.83	2.79
3	29.96	72	69.3	77	72	72.5	94	e.	1-0	10	29.99	29.89	0.14
4	30.00	74	66.5	83	70	67.5	73	e-ne.	1	4-1	30.04	29.94	0.00
5	29.95	70	66.5	82	71	64.7	66	ene.	1	1-5	30.03	29.94	0.00
6	29.93	75	68.5	83	70	66.0	72	ene.	3	3	29.99	29.91	0.01
7	29.96	72	69.3	83	71	66.0	68	ne.	2	4	29.99	29.90	0.14
8	30.00	76	67.5	82	71	66.5	70	nne.	2-3	5	30.06	29.95	0.01
9	29.96	75	70	83	75	66.3	70	nne.	4	5	30.05	29.96	0.08
10	29.86	72	68	82	72	67.3	70	ne.	3	5	29.99	29.87	0.02
11	29.86	68	66	82	71	67.0	74	e-s	1-0	4-10	29.91	29.81	0.00
12	29.91	71	68	82	68	67.3	81	n-s.	1	6-10	29.96	29.86	0.01
13	29.89	75	68	83	70	67.7	74	nne.	1-4	6	29.96	29.89	0.08
14	29.89	74	68	82	71	65.5	68	ne.	3	6	29.93	29.85	0.01
15	29.90	72	69	82	73	66.0	69	nne.	3	3	29.94	29.85	0.00
16	29.93	70	68.5	83	69	67.5	74	ne.	3	5-1	29.97	29.90	0.04
17	29.95	74	69	82	69	66.5	75	nne.	3	4	30.00	29.92	0.02
18	29.95	71	68.3	82	72	66.3	69	nne.	3	4	30.00	29.92	0.01
19	29.96	69	67	82	69	67.7	76	ne.	3	5	30.00	29.92	0.04
20	29.99	69	66	83	66	67.7	75	ne.	3	3	30.04	29.96	0.02
21	29.98	66	64.7	83	69	66.5	72	ne.	3-2	2	30.03	29.95	0.00
22	29.93	70	68	83	66	66.7	77	nne.	4-0	1	30.02	29.91	0.00
23	29.92	72	70.5	81	68	69.7	84	ne.	2-0	7	29.98	29.90	0.07
24	29.92	70	69.3	81	72	69.0	78	nne.	1-5	7-1	29.99	29.89	0.03
25	29.94	70	68.7	81	69	68.7	84	ne.	2	6	29.99	29.90	0.03
26	29.95	73	69	80	68	68.5	82	ne.	2-4	8-6	29.99	29.93	0.28
27	29.94	76	70.5	80	70	68.3	75	ne.	3	4	29.99	29.91	0.12
28	30.00	76	71.5	82	72	69.0	73	ne.	4-5	4	30.03	29.94	0.01
29	29.99	76	70	82	74	68.7	73	ene.	3-1	4	30.04	29.95	0.00
30	29.98	74	70.5	82	75	68.7	74	ne.	3-4	3	30.05	29.95	0.00
31	30.00	71	69.7	82	70	71.0	83	ne.	2	4	30.03	29.94	0.00
Sums.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	4.14
Means.	29.941	72.2	68.7	81.9	70.5	67.8	76.0	.....	2.3	4.7	29.994	29.906	.....
Departure.	—0.016	.....	.....	.....	.....	+1.7	+3.5	.....	.....	+.4	.....	.....	+1.68

*This pressure is as recorded at 1 p. m., Greenwich time. †These temperatures are observed at 6 a. m., local, or 4:31 p. m., Greenwich time. ‡These values are the means of (6+9+2+9) ÷ 4. §Beaufort scale.

Mean temperature for October, 1901 (6+2+9) ÷ 3=75.8°; normal is 76.3°. Mean pressure for October (9+3) ÷ 2=29.950; normal is 29.966.

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Manuel E. Pastrana, Director of the Central Meteorologic-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the Boletin Mensual. An abstract, translated into English measures, is here given, in continuation of the similar tables published in the MONTHLY WEATHER REVIEW since 1896. The barometric means are now reduced to standard gravity.

Mexican data for October, 1901.

Stations.	Altitude.	Mean barometer.*	Temperature.			Relative humidity.	Precipitation.	Prevailing direction.	
			Max.	Min.	Mean.			Wind.	Cloud.
	Feet.	*Inch.*	° *F.*	° *F.*	° *F.*	%	*Inch.*		
Chihuahua	4,669	25.28	84.2	55.4	65.8	65	2.29	e.	.....
Guadalajara (Obs. del. Est.)	5,186	24.94	78.3	55.4	68.4	70	4.60	nw.	.....
Guanajuato	6,640	23.69	83.3	43.7	64.4	53	0.28	ene.	.....
Leon (Guanajuato)	5,906	24.29	78.3	41.4	63.3	71	0.94	ne.	.....
Linares	1,188	28.44	88.7	53.6	73.9	76	3.39	s.	.....
Mazatlan	25	29.84	89.4	72.9	81.7	78	2.12	nw.	.....
Merida	50	29.87	95.0	62.1	78.3	81	1.28	ne.	.....
Mexico (Obs. Cent.)	7,472	23.05	74.5	42.8	58.8	66	1.14	n.	.....
Monterrey (Sem.)	1,626	28.34	101.1	48.2	71.4	74	3.28	ene.	.....
Morelia (Seminario)	6,401	23.87	75.9	47.5	61.7	73	1.59	ne.	.....
Puebla (Col. Cat.)	7,125	23.37	76.6	47.1	62.4	66	0.36	ene.	.....
Puebla (Col. d. Est.)	7,118	23.34	77.0	43.0	62.1	65	0.26	ene.	.....
Queretaro	6,070	24.20	78.3	47.3	62.8	61	0.15	e.	.....
S. Isidro (Hac. de Gto)	.....	.....	78.8	61.7	.....	.....	1.38	.....	.....
Toluca	8,812	21.95	70.9	34.9	54.9	68	1.13	w.	.....
Zapotlan	5,078	25.06	80.6	53.2	67.8	68	4.24	n.	.....

*Reduced to standard temperature and gravity.

RECENT PAPERS BEARING ON METEOROLOGY.

W. F. R. PHILLIPS, in charge of Library, etc.

The subjoined titles have been selected from the contents of the periodicals and serials recently received in the library of the Weather Bureau. The titles selected are of papers or other communications bearing on meteorology or cognate branches of science. This is not a complete index of the meteorological contents of all the journals from which it has been compiled; it shows only the articles that appear to the compiler likely to be of particular interest in connection with the work of the Weather Bureau:

Scientific American. New York. Vol. 85.

—— Santos Dumont wins the Deutsch Prize. P. 312.

Hopkins, George M. A few Meteorological Instruments. P. 312.

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Kesslitz, Wilhelm. Report on the Magnetic Observations made at Pola, Austria, during the time of the Total Solar Eclipse of May 17, 18, 1901. Pp. 123–125.

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Snellen, Maurits. Report on the Magnetic Observations made at the de Bilt Meteorological and Magnetic Observatory near Utrecht, Holland, during the Total Solar Eclipse of May 17, 18, 1901. Pp. 129–134.

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Otto, Marius. L'éclair en boule. Pp. 361–362.
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Sagnac, G. Mode de production de rayons lumineux divergents à 180° du Soleil. Pp. 703–704.
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—— Observations diverses sur les aurores polaires et l'électricité atmospérique. Pp. 402–404.
La pluie dans l'Inde et les variations de la température solaire. Pp. 405–406.
—— Hygromètres à branche d'épicéa. Pp. 406–407.
—— Grêle remarquable. P. 408.
Prinz, W. De l'influence des courants de convection sur les indications d'instruments très mobiles. Pp. 409–426.
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Erzherzog Leopold Ferdinand. Zum Kapitel der Staubregen. Pp. 460.
—— Charles Meldrum. P. 460.
—— Vorläufiger Bericht über die internationale Ballonfahrt vom 4 Juli, 1901. Pp. 460–461.
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—— Frank Very über seine Experimentaluntersuchen über atmosphärische Strahlung. Pp. 472–473.
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—— Direkte Erzeugung der X-Strahlen in der Luft. P. 476.
Wolfer, A. Provisorische Sonnenflecken-Relativzahlen für das III Quartal 1901. P. 476.

THE MEASUREMENT OF SUNSHINE AND THE PRELIMINARY EXAMINATION OF ANGSTRÖM'S PYRHELIOMETER.

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While the writer was in attendance last August at the convention of Weather Bureau officials held in Milwaukee he was plied with numerous questions pertaining to the instrumental work of the Weather Bureau, many of which related to the measurement and registration of sunshine, especially in varying degrees of intensity. The sunshine recorders[1] at present in use at Weather Bureau stations are recognized as at best but imperfect, and the records only approximate and incomplete.

The urgent need of decidedly improved apparatus for this purpose is keenly appreciated by many of our officials whose close daily relation with agricultural interests emphasizes the incomplete character of the data at present available. The subject is one, however, which is but imperfectly understood by the majority of those who discussed the question with me, and it seems appropriate, therefore, at this opportunity to preface the present account of the comparison of pyrheliometers with a few brief statements of the general principles underlying measurements of solar radiation.

The present state of our knowledge of this intricate and deeply involved problem has just been summarized by Mr. Frank W. Very[2] in an excellent article which is recommended to everyone studying this question. This writer, however, as necessity compells in so condensed a summary, presupposes a reasonable acquaintance with the subject on the part of his readers, whereas, it is desired in what follows, to set forth briefly such elementary facts and principles as will help the

[1] Annual Report of the Chief of the Weather Bureau, 1891–92, p. 30; Annual Report of the Chief of the Weather Bureau, 1893, p. 18.
[2] The Solar Constant. MONTHLY WEATHER REVIEW, August, 1901, p. 357.

less fully informed reader to more perfectly comprehend the whole subject.

The solar energy which, when received at the surface of the earth, produces all our optical, thermal, electric, and chemical phenomena, obviously must first traverse the envelope of atmosphere surrounding the earth. This atmosphere even when in the clearest condition absorbs or intercepts at least a small part, and, under less favorable conditions, a very considerable part of the energy which arrives at its extreme outer limits. Measurements therefore of solar radiation made in the lower regions of the atmosphere necessitate also a study of the absorption by the atmosphere. The absorption of the radiant solar energy by gases and vapors and its dispersion and diffusion by dust and other minute constituents of the atmosphere are exceedingly complex phenomena, and are, in fact, at the best but partly understood or measured quantitively at the present time.

It is well known that ordinary white sunlight is made up of all the colors of the rainbow. It is, perhaps, less generally known that this so-called "visible spectrum" is but a small part of the whole solar spectrum, portions of which, invisible to the human eye, extend beyond the violet and especially far below the red. All these successive portions correspond, respectively, to radiant solar energy of different wave lengths. Some of the waves traverse the atmosphere with almost perfect facility, whereas others are in part, and some almost wholly, suppressed or absorbed and dispersed; and no study of atmospheric absorption can be complete without a full analysis of the "selective absorption" of the waves of different length by the air and its constituents. It is plain to be seen that this task is both complex and difficult to accomplish in a highly satisfactory manner.

For agricultural purposes, however, the heat effect actually produced at the surface of the earth is the desideratum, and we need very much an instrument that will measure and register this hour by hour and day by day, much the same, for example, as we now measure the movement of the wind hour after hour, or the amount of precipitation season after season.

Impressed with the visible heating power of the sun as shown by its effects on thermometers and articles generally exposed to its direct influence, almost every one seeking to measure this radiant energy is apt to set out with a thermometer, especially one with a blackened bulb, the indications of which are considered to measure in degrees the intensity of solar radiation. This is a serious mistake, but it is embraced so generally that it can not be too strongly condemned. I do not mean to imply that observations of temperature in the sunshine can not be used to measure solar radiation, but for this purpose secondary observations of other conditions are equally important, and, at the best, many difficulties are encountered. The whole matter will, I think, be much better understood by a concrete illustration.

Suppose I desire to measure the rainfall during a storm, but that I have for this purpose a rain gage such as indicated in Fig. 1. We will suppose this vessel is made of glass, so that the contents within may be seen from the outside, and that the slender stem is graduated. The point at which this gage differs essentially from an ordinary gage is that the bottom has a hole in it at *A*. Furthermore, I am obliged to use this gage with the bottom open. I expose it so that the rain falls into it freely, and I will assume that the hole in the bottom is not so large but that even with a slow rainfall at least a small quantity of water will stand in the tube at the bottom. Now, what shall we find with such a gage as this? If the rain falls continuously, it will be seen that the water rises in the graduated tube and stands steadily at a certain point, such that the water runs out of the hole in the bottom just as fast as it flows in at the top. If the rain falls more rapidly, the water will stand at a higher point in the tube, but it will also run out at the bottom more rapidly. Obviously, it will stand lower and run out more slowly when the rain falls less rapidly, etc. We might experiment with this gage by dropping or pouring water into it until the column attained a certain height, then, suddenly cutting off the inflow, we could note the exact time required for, say, a cubic inch of water to run out at the bottom. From a series of experiments like this, with suitable variations, we could develop at least two important laws of action of the gage, namely: first, that the rate of outflow differs noticeably for each height of the column; second, that for a given height of the column the rate of outflow is sensibly the same every time the experiment is repeated. Finally, the quantity of outflow, and hence of inflow, corresponding to each point of the graduated scale would be established. Such a gage can, it is true, be used for measuring rainfall, but everyone will admit it is far from a convenient or satisfactory instrument for this purpose. Bad as it is, however, it is better for measuring precipitation than is a thermometer placed in sunshine for measuring solar radiation.

FIG. 1.

The trouble in both these instruments is that the water in the one case and the heat in the other escapes as fast as it is received. When the column of the thermometer is stationary it loses heat just as fast as it receives it, but, unlike the rain gage, which, as we have seen, loses and receives water always at the same rate for a given indication of the column, the heat lost and received by the thermometer has practically no definite relation to the height of the column of mercury; in fact, we are obliged to measure the loss in some way for each particular case. In the rain gage the water is received only at the top and lost only at the bottom; the thermometer, however, receives and loses heat in a great variety of ways. Heat is exchanged, for example, by radiation to and from every surrounding object; by convection currents in the air, or by the wind; by conduction along the stem, etc. It is plain to be seen that all these circumstances greatly complicate the use of thermometers in all such measurements as we now have under consideration.

The point we want to emphasize and present in a forcible manner in this illustration of the rain gage is that in the case of the thermometer there is an irregular outflow of heat, as well as an inflow, that must be looked after and carefully included in all considerations. Those who have but partly studied the subject often direct attention quite wholly to the inflow, or they virtually assume that the outflow is an invariable one, and hence are led to erroneous conclusions.

It is not the purpose of the present paper to describe the relatively complicated processes that have been developed by which to measure solar radiation, but it is plain that any apparatus which registers only variations in the temperature indicated by a thermometer exposed directly to sunshine fails to give any useful record of solar radiation, unless the irregular exchange of heat with the surroundings is fully controlled or compensated.

A little thoughtful consideration of the fact that we are actually dealing with an outflow, as well as an inflow of heat in this problem leads us at once to the next important consideration, namely, that units of temperature are not suitable units in which to measure solar radiation. We measure water in pounds, or gallons, or cubic feet. We measure heat in thermal units, or calories. With possible rare exceptions the metric units are now the only ones employed in measures of solar radiation, and in this case the unit is the calorie, that is, the quantity of heat required to raise one gram of water 1° in temperature on the centigrade scale. This quantity of

heat is also often called the gram-calorie, in order to distinguish it from a much larger quantity of heat, also unfortunately called a calorie, namely, the quantity of heat required to raise the temperature of a kilogram of water 1° centigrade.

The foregoing considerations indicate the lines along which improvement in instruments for measuring and recording sunshine must be worked out. Many valuable suggestions will be found in a report by Violle in the Proceedings of the International Meteorological Committee, St. Petersburg meeting, 1898.

Solar constant.—Having outlined in what precedes the fundamental principles which must guide us in studies of solar radiation, we will state briefly the general numerical results of the most satisfactory measurements thereof and the value of the solar constant deduced thereby.

The intensity of the solar radiation, received and measured at the surface of the earth, varies greatly depending upon the condition of the atmosphere and the thickness of the layer of air traversed by the solar rays as modified by the latitude of the place, the hour of the day, the season, the altitude, or the barometric pressure, etc. Under the most favorable conditions when the sun is in the zenith it may attain to almost 3 gram-calories per square centimeter per minute. That is to say, if all the solar heat which falls on a square centimeter of surface, normally exposed to the sun is expended in warming water, the heat will increase the temperature of almost 3 grams of the water 1° centigrade in each minute of time. Ordinarily, however, owing to the interception by the atmosphere of considerable portions of the heat the value is much less than three calories.

Taking the maximum readings of solar radiation that may be obtained from time to time and applying such corrections to each as shall compensate for the loss of heat in transit through the atmosphere at the time, we obtain the so-called "solar constant," that is to say, the heat received from the sun at a point just outside our atmosphere. To be strictly accurate this value must be reduced to one corresponding to a definite distance from the sun, as the distance of the earth from the sun undergoes certain well known annual changes.

From the best data now available on this subject, it seems that the solar constant, as defined above, is about 3.1 gram-calories per square centimeter per minute.

The Weather Bureau has recently undertaken a series of special studies of the whole question as to the value of the solar constant and its variations, if any, with time, and the remainder of this paper will be devoted to a brief description of the preliminary tests and intercomparisons of the Angström electric compensation pyrheliometers to be employed in this work.

The apparatus is designed primarily with a view to easy portability and its use in the field, on mountain tops, and in places remote from the usual facilities of installation. The pyrheliometer with all its accessories, mounted on a slender tripod, is shown in Plate I. The total weight, packed in the carrying case is 19½ pounds.

The pyrheliometer proper is within the tube, *AB*. The galvanometer and telescope, by means of which temperature adjustments are effected, as will be more fully explained hereafter, are suspended at *C*. *D* is a small slide wire rheostat. *H* is an ammeter with which the strength of the electric current is measured. The carrying case with a single cell of Leclanche battery is seen below.

The mechanism of the pyrheliometer is shown in the upper left-hand corner of Plate I, and occupies about one-half the length of the tube, *AB*. *A* and *B* are two very thin bands of platinum foil, about 1.5 millimeters wide and 20 millimeters long. The back of each band is coated with a thin layer of silk insulating paper, and cemented against this is a thin strip of copper foil, very similar to the platinum bands themselves. Finally, the middle points of the copper strips are joined to each other by a small inverted ∩-shaped piece of constantan[3] wire. A portion of this wire is plainly seen at *c c*. The ends are hammered down thin near the junction with the copper bands. The several parts are so mounted that the copper bands are in electrical connection with the small lateral rods terminating at *T* and *T'*, respectively. The opposite ends of these rods terminate in binding screws, one of which can be partly seen at *E*. Both platinum bands are joined at the lower end to the terminal, *F*, and at the top end connect respectively to the terminals, *G* and G' *L* is the top end of a switch lever. In the position shown the electrical circuit is closed through *G* and the platinum strip, *A*. When the switch is thrown to the right the circuit is opened through *A*, and closed through *G'* and the band, *B*. The platinum bands are carefully coated with lampblack.

The pyrheliometer tube, *AB*, is closed at the upper end with a cap having two slits or openings. A small double shutter is pivoted back of this cap in such a manner that one or the other of the two openings can be closed by the shutter, or the shutter may be given a middle position in which both slits are open. A series of diaphragms with rectangular apertures, successively smaller, occupy the space in the tube between the cap and shutter and the platinum bands. These serve to intercept stray radiation and limit the exposure to the rectangular aperture across which the platinum bands, *A* and *B*, are stretched. A small thermometer, *t*, indicates, approximately, the temperature within the tube, *AB*.

The action of the instrument involves the use of two distinct and separate electrical currents. The one is the thermoelectric current produced by the constantan-copper thermoelectric junctions, *c*, *c*, on the back of the platinum strips. This current flows through the galvanometer and is generated only when there is a difference in temperature between the two bands, *A* and *B*. The other current is furnished by a cell of Leclanche battery, or equivalent. This current is controlled and its strength regulated by means of the rheostat, *D*, and then passes through one or the other of the bands, *A* or *B*, as determined by the position of the switch, *L*, thence through the ammeter, *H*, where the strength of the current is indicated.

The apparatus is set up so that the tube, *AB*, points directly toward the sun, as determined by means of suitable sights for that purpose. The shutter is first set so that both bands are exposed to the sun and are therefore equally heated. The needle of the galvanometer, *G*, is then adjusted, if necessary, so that the middle portion of the galvanometer scale, *S*, appears plainly in the field of view.

It is assumed the bands, *A* and *B*, are equally heated by the sun, as they must be, seeing that they are as similar as possible and are otherwise equally circumstanced. The thermoelectric junctions at *c*, *c*, on the back of the bands must, then, have the same temperature, and therefore no thermoelectric current flows through the galvanometer. The scale reading, under these conditions, is the zero position of the galvanometer. If now the shutter be turned so as to screen the band, *B*, for example, leaving *A* exposed to the sun, the shaded band will cool off and the galvanometer will deflect. Now, let a current from the battery be sent through the shaded band, *B;* the latter will be heated thereby, and by a suitable adjustment of the rheostat the galvanometer needle will be returned to its original zero position. This means that the shaded band, *B*, is now heated by the electric current sent into it until its temperature is the same as that of the band, *A*, exposed to the sun. We thus have two bands, themselves equal,

[3] This is an alloy which forms a strong thermoelectric couple with copper.

both at the same temperature, both in the same environment, both losing and receiving heat at the same rate; the one heated by the solar radiation, the other by an electric current. The amount of heat generated by the electric current is easily calculated with accuracy when we know its strength and the resistance of the platinum bands. Thus we are able to measure the solar radiation in a very satisfactory manner.

The following general instructions have been issued for the guidance of those using the pyrheliometers.

The apparatus being completely mounted the full details of a complete observation are about as follows:

1. Start with current off; i. e., rheostat switch on neutral point. Point tube to sun by aid of sights and set shutter in central position so that the sun heats both strips.
2. Note and record: *a*, the temperature of attached thermometer; *b*, the time; *c*, the zero position of galvanometer.
3. Designating the two strips by the letters *A* and *B;* screen *B* and set switch at back of tube so that current passes through *B*.
4. Cut in current and adjust rheostat, so that the galvanometer needle returns as nearly as may be to the zero reading recorded under (2).
5. When the adjustment under (4) is attained read and record ammeter.
6. Screen *A* and switch current through it and readjust rheostat, if necessary, as in (4).
7. Read and record ammeter for No. 6 adjustment.
8. Note sights on tube and readjust pointing of pyrheliometer, if necessary.
9. With *A* still screened, readjust rheostat, if necessary, and restore galvanometer to zero.
10. Read and record ammeter.
11. Screen *B*; switch current through it and restore galvanometer to zero.
12. Read and record ammeter.
13. Set shutter in middle; i. e., expose both strips to the sun and cut off current at rheostat.
14. Read and record zero position of galvanometer.
15. Note and record time; also temperature of attached thermometer.

The following example is given of a set of readings forward and back on pyrheliometer No. 34.

October 29, 1901.	Temperature. Centigrade.	Bands exposed.			Gram-calories per sq. cm. per minute. *Q.*
		Both A and B.	A.	B.	
		Gal. reading.	*Amperes.*	*Ampere .*	
2:00 p. m	21.9	153	.331	.325	0.778
2:05 p. m	22.0	134	.335	.325	0.787

In computing the results the mean of the two determinations of current strength should be multiplied by the coefficient taken from Angström's table of constants corresponding to the temperature shown by the reading of the attached thermometer. (See Table 5.) The result is the gram-calories of heat received from the sun per square centimeter, per minute, as observed at that place and moment of time. From this the solar constant is to be determined by further investigations into the absorption by the atmosphere.

The observations may possibly be abridged somewhat without loss of accuracy, and, on the other hand, if difficulty is found in restoring the galvanometer to zero in a satisfactory manner, it may be necessary to record the reading and establish a slight correction for the discrepancy.

Before undertaking a direct comparison of the pyrheliometers it was necessary to compare the three Weston direct reading ammeters used in the measurement of current strength.

For this purpose the three instruments were joined in series with a battery and with an adjustable resistance, which latter was regulated so as to bring the index on ammeter No. 4321 to a particular division, whereupon an assistant noted, simultaneously, the readings on the two remaining instruments.

Each instrument has a double scale, one, the upper scale, from 0 to 500, divided into 100 equal parts; the other, the lower scale, from 0 to 10, also divided into 100 parts. The following table gives the readings made:

TABLE 1.—*Comparison of Weston ammeters.*

Scale readings (for upper scale).

No. 4321.	No. 4306.	No. 4315.
Amperes.	*Amperes.*	*Amperes.*
.0500	.0495	.0500
.1000	.0990	.0998
.1500	.1480	.1500
.2000	.1980	.2000
.2500	.2490	.2500
.3000	.2998	.3000
.3500	.3498	.3495
.4000	.3998	.4000
.4500	.4498	.4490
.5000	.5000	.4978

Scale readings (for lower scale).

No. 4321.	No. 4306.	No. 4315.
Amperes.	*Amperes.*	*Amperes.*
.00200	.00200	.00200
.00400	.00399	.00400
.00600	.00601	.006005
.00800	.008005	.00800
.01000	.01000*	.009995

*And off the scale.

The greatest discordance at any point seems to be about 1.3 per cent at 0.150 ampere on No. 4306.

Next the pyrheliometers, in pairs, were directly compared in the sunshine. In the first comparison, October 25, the readings were not made forward and back, in the manner explained in the instructions, but were recorded directly in the order indicated.

The results are given in full in the accompanying tables.

The column of results headed "calories, etc.," is computed by the equation—

$$Q = k\left(\frac{A+B}{2}\right)^2$$

in which the value of the constant k is taken from Table 5 for the particular instrument in question, and the corresponding temperature recorded for the observation.

TABLE 2.—*Comparison of Angström's pyrheliometers.*

	Pyrheliometer No. 31. Ammeter No. 4321.					Pyrheliometer No. 34. Ammeter No. 4306.				
Oct. 25, 1901. Time, p. m.	Band exposed to sun.			Temperature, C.	*Q.*	Band exposed to sun.			Temperature, C.	*Q.*
	Both A and B.	A.	B.		Cal. per sq. cm. per min.	Both A and B.	A.	B.		Cal. per sq. cm. per min.
	Gal. zero.	*Amp.*	*Amp*	°		*Gal zero.*	*Amp*	*Amp*	°	
2:05	117	.398	.396	18.0	1.12	110	.380	.385	16.1	1.05
2:17	115	.402	.400	18.0	1.14	118	.378	.403	16.0	1.10
2:22	115	.403	.405	18.5	1.16	84	.402	.405	16.0	1.18
2:24	117	.398	.396	17.5	1.13	102	.395	.396	16.0	1.13
2:34	118	.395	.403	18.6	1.13	95	.400	.385	16.5	1.11
2:38	120	.391	.400	18.1	1.12	105	.388	.388	16.5	1.09
2:42	117	.398	.398	18.1	1.13	102	.395	.387	16.0	1.10
2:49	121	.394	.385	17.2	1.08	95	.398	.395	16.0	1.13
2:52	115	.388	.397	17.3	1.09	90	.407	.372	16.5	1.10
2:58	119	.384	.382	17.2	1.04	120	.370	.397	16.1	1.06
3:02	116	.380	.386	17.0	1.04	98	.380	.382	16.0	1.05
Mean of 11 observations					1.106	.....	.....	.....	.....	1.100

TABLE 3.—*Comparison of Angström's pyrheliometers.*

Oct. 29, 1901. Time, p. m.	Pyrheliometer No. 28. Ammeter No. 4315. Temperature, C.	Band exposed to sun. Both A and B.	A.	B.	Q. Cal. per sq. cm. per min.	Pyrheliometer No. 34. Ammeter No. 4306. Temperature, C.	Band exposed to sun. Both A and B	A.	B.	Q. Cal. per sq. cm. per min.
	°	*Gal. zero.*	*Amp.*	*Amp.*		°	*Gal. zero.*	*Amp.*	*Amp.*	
1:30	21.6	125	.308	.340	.815	21.2	117	.339	.350	.854
1:37	21.6	134	.295	.338	.795	21.0	106	.341	.350	.864
1:40	21.5	126	.299	.345	.820	21.0	111	.330	.350	.835
1:45	21.4	138	.308	.335	.805	21.0	88	.345	.352	.874
1:47	21.8	126	.300	.340	.810	21.5	95	.347	.341	.855
1:52	21.9	141	.303	.335	.804	21.9	89	.344	.343	.855
1:54	21.5	128	.298	.335	.795	21.9	144	.352	.342	.870
1:57	21.7	145	.295	.330	.770	21.9	148	.341	.341	.841
2:00	21.1	135	.285	.325	.735	21.9	153	.331	.325	.778
2:05	21.0	150	.293	.315	.730	22.0	134	.335	.325	.787
2:09	21.0	134	.297	.310	.725	21.0	186	.315	.364	.835
2:13	21.1	149	.292	.310	.716	21.7	165	.307	.364	.816
2:18	21.0	129	.290	.310	.711	21.6	165	.327	.362	.855
2:25	21.5	150	.252	.306	.698	21.2	130	.300	.357	.777
2:26	21.5	139	.283	.317	.712	21.2	138	.330	.320	.762
2:31	21.2	150	.285	.312	.702	21.0	110	.353	.318	.815
2:34	21.4	142	.282	.312	.698	21.0	116	.348	.293	.758
2:39	21.2	148	.280	.305	.674	21.0	157	.293	.290	.616
2:40	21.2	142	.283	.309	.678	21.1	160	.308	.335	.749
2:44	21.1	155	.275	.301	.655	21.0	113	.330	.333	.796
Mean of 10 pairs of observations...					.7424					.8006

The constants of the instruments were very carefully determined by Knut Angström, and are combined in the following table:

TABLE 4.—*Constants of pyrheliometers.*

	No. 28.	No. 31.	No. 34.
Electrical resistance of the bands at 20° C. (r)	0.0810	0.0731	0.0751
Coefficient of variation of resistance with temperature	.00045	.00045	.00045
Width of bands (b) centimeters	0.150	0.150	0.152
Absorbing power of the surfaces (a)	0.98	0.98	0.98

The intensity of radiation is given by the relation

$$Q = \frac{r\, i^2}{4.19\, b\, a}\ 60 \text{ gram-calories per min. per cm.}^2$$

Or $$Q = k\, i^2.$$

(i = intensity of the current in amperes.)

The coefficient k has, at different temperatures, the following values:

TABLE 5.

Temperature, C.	−10°	0°	10°	20°	30°	40°
Instrument.	k.					
No. 28	7.80	7.83	7.87	7.90	7.94	7.97
No. 31	7.02	7.06	7.09	7.13	7.16	7.19
No. 34	7.12	7.15	7.19	7.22	7.26	7.29

NOTES BY THE EDITOR.

WEATHER BUREAU MEN AS INSTRUCTORS.

Mr. George E. Franklin, Local Forecast Official, Los Angeles, Cal., has given instruction to the class in physical geography of the Los Angeles High School in the construction and use of meteorological instruments and the general work carried on at stations of the Weather Bureau. For this purpose the class, which numbers about 150, visited the local Weather Bureau office in sections on different days during the latter part of the month. Similar instruction is to be given to the pupils of other schools during the winter.

Mr. A. E. Hackett, Section Director, Columbia, Mo., has undertaken the instruction of a class in climatology in the Missouri State University. The class meets each Friday during the first semester and a greater portion of the time will be devoted to the study of the more important climatic features of the various sections of the United States. This course is now required in the Missouri State University for the degree of Bachelor of Science in Agriculture.

Mr. H. W. Richardson, Local Forecast Official, Duluth, Minn., reports that on October 24 he addressed the senior class of the Convent of the Sacred Heart at his office, the topic being the United States Weather Bureau. On October 29, the senior class of youpg ladies from the Craggencroft Private School, Duluth, Minn., visited the office and after explaining the various instruments, Mr. Richardson addressed them upon Weather Forecasting and the Work of the United States Weather Bureau.—*H. H. K.*

APPLIED CLIMATOLOGY.

By practical climatology we ordinarily mean the observing and recording of the weather, the preparation of mean values and the application of this climatological knowledge to the benefit of mankind. Practical meteorology implies similar observations but a different form of record, i. e., the daily weather map and the study and prediction of storms and changes in the weather.

There are many other fields for the application of our knowledge of climatology and one of the most interesting is that branch of geography called physiography or the study of the action of the atmosphere in altering the surface features of the earth.

As many of the readers of the MONTHLY WEATHER REVIEW are teaching geography, climatology, and physiography, we believe that they will often find opportunity to utilize ideas drawn from the following outline of the subjects treated of by Prof. Dr. George B. Shattuck of Johns Hopkins University in his recent course of public lectures in Baltimore.

GEOGRAPHY OF NORTH AMERICA.

LECTURE I.

SUBJECT.—PHYSIOGRAPHIC FEATURES OF NORTH AMERICA.

Relations of continental plateaus and ocean basins.—Methods of sounding: lead line; Sigsbee sounding machine. Contour of ocean bottom: levels; ridges; deeps. Contour of continental plateaus: continental shelf; submarine earthquakes; cable ruptures.

Relations of North America to the other continents and to the surrounding ocean basins.—Atlantic basin; Pacific basin; Arctic basin; Antillian basin.

Hypsometric features of North America.—Atlantic Plain: position; extent; characteristics; subdivisions—Coastal Plain, Piedmont Plateau. Appalachian Mountain System: position; extent; characteristics; subdivisions—Blue Ridge, Appalachian Valley, Cumberland-Allegheny Plateau. Great Central Plain: position; extent; characteristics; subdivisions—Laurentian Highlands, Mackenzie River Basin, St. Lawrence Valley, Mississippi Valley, Prairie Steppes, Black Hills, Ozark Mountains, Llano Estacado, Bad Lands. Cordilleran Mountain System: position; extent; characteristics; subdivisions—Rocky Mountains, Plateau Country, Great Basin, Coast Ranges. Antillian Mountain System: position; extent; characteristics; subdivisions—Greater Antilles, Lesser Antilles, Bahamas, Trinidad-Tobago group, Mountains of Central America.

LECTURE II.

SUBJECT.—CLIMATOLOGY AND HYDROGRAPHY.

Climatology.—Definition of climate: precipitation: evaporation; circulation; condensation; storms; distribution of rainfall. Temperature: heat in atmosphere; ocean currents—horizontal, vertical; mean annual temperature; variation in temperature.

Hydrography.—Drainage basins of North America: Atlantic; St. Lawrence; Hudson Bay; Arctic; Bering Sea; Pacific; Gulf of Mexico. Harbors of North America: conditions necessary for good harborage. Nature and origin of harbors: delta harbors; drowned river harbors; lagoon harbors; moraine harbors; coral reef harbors. Geological actions which tend to improve or depreciate harbors. Harbors of North America: for a discussion of this topic see 13th Annual Report, United States Geological Survey, pp. 160–209. Lakes of North America: lakes of Glacial origin; coastal lagoon lakes; river lagoon lakes; closed basin lakes; lakes formed by mountain movements.

LECTURE III.

SUBJECT.—CONTINENTAL GROWTH OF NORTH AMERICA.

Geologic Time.—Subdivisions of the time scale; age of the earth.
Evolution of life.
Pre-Cambrian Time.—Beginning of geologic history; Algonkian land masses; life in pre-Cambrian Time.
North America in Paleozoic Time.—Cambrian; Silurian; Devonian; Carboniferous.
North America in Mesozoic Time.—Triassic; Jurassic; Cretaceous.
North America in Cenozoic Time.—Eocene; Miocene; Pliocene; Pleistocene.
Conclusion.—Permanency of the North American Continent.

LECTURE IV.

SUBJECT.—MINERALS AND SOILS OF NORTH AMERICA.

Nonmetallic minerals.—Coal; petroleum; natural gas; phosphates; origin, geologic and geographic distribution.
Metals.—Placer deposits: chemical deposits: unstratified deposits; veins—origin, structure, dip, strike.
Modification of deposits by earth movement.
Geographic distribution of metals.—Gold; silver; copper; lead; zinc; tin; nickel.
Origin of soils.—Wind; rain; rivers; frost; glaciers; animals.
Soil texture.
Soil structure.
Distribution of soils.

PHYSIOGRAPHY.

LECTURE I.

SUBJECT.—THE GEOLOGICAL WORK OF THE ATMOSPHERE.

Geologic circulation.—Uplift; erosion; transportation; sedimentation.
Atmospheric agencies.—Physics of atmosphere: upward extent of atmosphere; weight of atmosphere; composition of atmosphere; heat in atmosphere—source, variation; absorption in atmosphere—absorption of moisture, condensation of moisture; moisture in atmosphere—convection, circulation, storms.
Weathering effects of atmosphere.—Changes of temperature: mechanical effects of wind: on land—removal, etching; on water—waves, currents, change of level.
Transporting effects of atmosphere.—Arid regions.
Sedimentation from atmosphere.—Dunes; ponded rivers; formation of soil; loess.

LECTURE II.

SUBJECT.—GEOLOGICAL WORK OF RAIN.

Cause of rain.
Erosive effects of rain.—Chemical work; caverns; mechanical work; impact; earth pillars.
Transporting effects of rain.—Material carried in solution; material carried in suspension; landslides.
Sedimentation due to rain.—Fossilization; spring deposits; cave deposits.

LECTURE III.

SUBJECT.—GEOLOGICAL WORK OF RIVERS.

Sources of supply.
Avenues of loss.
Erosive effects.—Chemical action; mechanical action.
Kinds of erosion.—Filing; pot holes; recession of falls; ox bows; recession of cliffs.
Transporting effects of rivers.—Substances carried in solution; substances carried in suspension.
Sedimentation of rivers.—Cause of deposition; alluvial cones; deltas; flood plains; terraces.

LECTURE IV.

SUBJECT.—GEOLOGICAL WORK OF RIVERS.

Cycle of a river.—Youth; adolescence; maturity; old age.
Antecedent.
Revived.
Superimposed.
Resurrected.
Adjusted.
Beheaded.
Captured.
Drowned.
Diverted.

THE BAROMETER AS USED AT SEA.

Ever since the first International Meteorological Congress at Vienna, in 1873, there has been a steady movement toward the full recognition of the general principle that atmospheric pressure is not correctly expressed by the height of a column of mercury unless that height be corrected for the effect of the variations in gravity as well as variations in temperature. The correction for gravity was early adopted by the Weather Bureau, by an order of General Hazen, so far as concerns observations at land stations, and probably at the present time no national service would do violence to modern science by neglecting this. On the other hand all must admit that if the effect of a change of gravity is important for the land, it is equally so for the ocean; it must be perceived that in this matter uniformity of practise is best and that the reduction to standard gravity ought to be applied to all mercurial barometers and to the isobars of all charts.

We are very glad to see that the United States Hydrographic Office has taken the proper stand in this matter, and is preparing to issue on its pilot chart isobars of standard pressures. We print the following extract from a recent instruction by Capt. C. C. Todd, Hydrographer, U. S. N., addressed to all branch hydrographic offices, and relating, as we understand, not only to the daily international simultaneous observations at 1 p. m., Greenwich time, but also to all other barometric work:

The adoption of a new form of barometer comparison card renders necessary the following instructions as to the use of the cards. Attention is also called to those paragraphs of Hydrographic Office Publication, No 119, referring to the subject of barometer comparisons.

* * * * * * *

Upon receipt of each card see that the character of the ship's barometer, whether mercurial or aneroid, is indicated in the appointed place.

If the ship's barometer is mercurial the reading given by the observer should be corrected by you for temperature, using for this purpose Table 3 of the "Barometer Correction Card" and reduced to standard gravity according to the Table 2 given below. The result is to be neatly entered in red ink in column 2 of the card.

If the ship's barometer is aneroid, neither of these corrections is necessary and column 2 should be left blank.

You will ascertain the reading of the office standard barometer at the given time of observation aboard ship. If the standard is mercurial the reading must be corrected for temperature, initial error, height above sea level, and reduced to standard gravity. If the standard is aneroid, it must be corrected for initial error and height above sea level.

The reduction to sea level is additive, and amounts to one hundredth inch (0.01) for each ten (10) feet of elevation. (See Table 1.) Enter the reading of the standard thus corrected in the third column of the card in red ink.

In column 4 enter, in red ink, the difference between the corrected reading of the ship's barometer and the corrected reading of the office standard, prefixing a plus (+) sign if the ship's barometer reads lower than the standard, a minus sign (—) if the ship's barometer reads higher than the standard. Divide the algebraic sum of these differences by the total number of readings and enter the result at the foot of the column, prefixing the proper sign.

All readings should be to the nearest hundredth of an inch and no further. Promptly forward the completed cards to the main office.

Comparisons should be made on several different days; not several on the same day. Readings on at least three (3) different days are necessary for a satisfactory determination of the error of the ship's barometer.

The standard barometer (both mercurial and aneroid) of the branch office should be compared once a week with the local standard of the United States Weather Bureau. In case of any discrepancy the latter

should be adopted as final, and the difference as the initial error of the office standard.

In comparing the office standard with the 8 a. m. (seventy-fifth meridian time) readings given on the Daily Weather Map, it should be remembered that the latter have been reduced to standard gravity. The reading of the office standard, if mercurial, must therefore also be so reduced before comparing.

If a self-recording aneroid is employed care should be taken to see that the times indicated on the barograph are correct. At local noon of each day the box should be tapped with sufficient force to slightly disturb the index hand. The exact point on the curve corresponding to local noon will thus be recorded.

If the ship's barometer gives the atmospheric pressure in millimeters the readings of the standard should be converted to millimeters before entering upon the card, using for this purpose Table 4 of the "Barometer Correction Card."

TABLE 1.—*Reduction of the barometer to sea level.*

Height.	Correction.
Feet.	*Inch.*
20	+0.02
140	0.14
160	0.17
300	0.31

TABLE 2.—*Reduction of the mercurial barometer to standard gravity (calculated for pressures between 29 and 31 inches).*

Latitude.	Correction.	Correction.
	Inch.	*Millimeters.*
0°	−0.08	−2.0
40	−0.01	−0.4
45	0.00	0.0
50	+0.01	+0.4
90	+0.08	+2.0

TABLE 3.—*Temperature correction (calculated for mercurial column of 29.50 inches).*

Attached thermometer.			Correction to be applied to reading.
Fahr.	Cent.	Réau.	
°	°	°	*Inch.*
5	−15.0	−12.0	+.06
6	−14.4	−11.6	
7	−13.9	−11.1	
27	− 2.8	− 2.2	.00
28	− 2.2	− 1.8	
29	− 1.7	− 1.3	
30	− 1.1	− 0.9	
95	35.0	28.0	−.18
96	35.6	28.4	
97	36.1	28.9	
98	36.7	29.3	

TABLE 4.—*Conversion of millimeters to inches.*

Mm.	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9
700	27.56	27.56	27.57	27.57	27.58	27.58	27.58	27.59	27.59	27.60
701	.60	.60	.61	.61	.61	.62	.62	.63	.63	.63
702	.64	.64	.65	.65	.65	.66	.66	.67	.67	.67
703	.68	.68	.69	.69	.69	.70	.70	.71	.71	.71
704	.72	.72	.72	.73	.73	.74	.74	.74	.75	.75
795	31.30	31.30	31.31	31.31	31.32	31.32	31.32	31.33	31.33	31.34
796	.34	.34	.35	.35	.35	.36	.36	.37	.37	.37
797	.38	.38	.39	.39	.39	.40	.40	.41	.41	.41
798	.42	.42	.43	.43	.43	.44	.44	.45	.45	.45
799	.46	.46	.47	.47	.47	.48	.48	.48	.49	.49

Especially do we note that the above instructions make full provision for a very important matter, viz, the determination of the initial error, or the error of zero point, or the general relation of the ship's barometer to the international standard adopted by the Weather Bureau and the Hydrographic Office.

When barometers are brought from vessels to the shore and hung alongside of a station instrument for comparative readings, it is usually found that the ship's barometer needs a correction in order to make it agree with the standard. Now a barometer is a comparatively delicate and complex instrument, and there is no assurance that this correction has not been changed or perhaps even wholly caused by some accident in bringing the instrument from the ship to the station; there is also no assurance that it will not again change when carried from the station back to the ship. It is, therefore, far better not to remove the barometer from its permanent place on shipboard. The correction that is desired can be just as well determined by simultaneous readings taken on the ship and at the land station of the Weather Bureau. The navigator has simply to reduce the ship's readings to standard temperature by Table 3, standard gravity by Table 2, and sea level by Table 1, and compare the result with the observations on land, or the isobars of the daily chart, which are also reduced to sea level, gravity, and temperature. The regular observations at 8 a. m. and 8 p. m., standard eastern time (which is the same as 1 p. m. and 1 a. m., Greenwich time), can be used for this purpose day after day. This is the method adopted and recommended by the Editor in 1871 for the voluntary marine work of the Signal Service, and continued when he took charge of the reduction and publication of the international simultaneous work in 1875. The Hydrographic Office very properly recommends that readings for comparative purposes should be made on at least three different days when the vessel is in port, but the Editor would hope that vessels may be able to maintain their record when in port as regularly as when at sea, so that there may be no breaks in the record.

It is highly important that all mariners should cooperate in this effort to attain the highest accuracy in their barometric observations. The little additional labor means a greater addition to meteorology. It is simply doing things in the right way instead of in a slipshod, wrong way.—*C. A.*

WHAT IS A STORM WAVE?

The following query was recently received by the Chief of the United States Weather Bureau:

The Standard Dictionary's definition of storm wave reads "A wave on the ocean surrounding a cyclonic area: caused by a difference in pressure." In the number for December, 1900, of Science and Industry, Mr. Ernest K. Roden published an article entitled "Revolving Storms." In this article he states that the storm wave is at the center of the storm area, and gives a sketch showing how it is formed. Would you be so kind as to favor us with your judgment as to the accuracy of these statements; which would you think is correct?

A board was appointed by the Chief of Bureau for the purpose of considering the definition of the term storm wave. The Chief also submitted to the board the following additional queries:

Does centrifugal force cause the water to be scooped out under the center of the cyclone, and to bank up in a ridge around its outer periphery; or does the decrease in air pressure, that is the result of centrifugal force, acting upon the water cause the water under the center of the cyclone to bulge up like an inverted soup plate?

A brief review of the literature on this subject will be of interest, not only on account of its bearing upon the significance of the term storm wave, but because it also gives us a full discussion of the meteorological conditions that produce this phenomenon.

In Piddington's Sailor's Hornbook, 1848, p. 127, we read:

Every seaman has also seen that under a waterspout the sea is boiling and foaming, and rising up, and traveling along with the spout, in a space of perhaps some two hundred yards or more in diameter, and he can suppose that, if a boat could live within it, it might be carried

along as far as the waterspout traveled, which would then be also a miniature representation of what we suppose to take place in the case of the storm wave, which at present, for we want information greatly on this as on many other points, we suppose to be somewhat as follows:

As there is no doubt that the atmospheric pressure when diminished in any one particular point of the globe occasions a temporary rise of the waters under this point, which are pressed up by all the rest, and that at the center of cyclones a diminution of pressure, which varies from an inch to two and a half inches of mercury, occurs, so there is no doubt that at this particular part of the center the water is raised a little more than a foot for every inch of fall of the mercury, or about two feet in ordinary cyclones, and proportionably over the whole area of them. The incurving of the wind * * * must also have a tendency to keep up and support a mass of water at, and toward this part, and we assume that this mass of water, or at all events a body floating upon it, is born by the conjoined action of the wind and this wave, onward in the direction of the path of the storm. This is what we denominate the storm wave, and what I have quoted and said is the theory or theoretical description of it.

From The Progress of the Development of the Law of Storms and of the Variable Winds, 1849, p. 102, by Lieut. Col. Wm. Reid, we quote the following:

In a paper communicated to the Royal Society of Edinburgh by Mr. Milne, and published in their Transactions for 1839, he describes two whirlwind storms which passed over the British Islands, and he thus speaks of the storm wave:

The effects of this gale on the waters of the Atlantic caused an unusually high tide in almost all parts in the Irish and English channels. I find that on Wednesday night, the 28th of November, 1838, Newry, a town to the north of Dublin, was inundated by the highest tide remembered. It was also a remarkably high tide at Strangford and at Donaghadee. On the same night, at Swansea, the tide rose seven feet two inches above its proper level. * * *

At Oban and Tobermory, though these places are completely landlocked and exposed to no swell from the ocean, all loose materials lying on the quays were swept off by the mere rise of the tidal waters. The height of the tide was there the more remarkable, as it was the season not of spring, but of neap tide. That this extraordinary elevation of the sea was occasioned by the suddenly diminished pressure of the atmosphere there is no doubt. The effect of this diminished pressure must have been to elevate the surface of the ocean, and produce a sudden accumulation of waters, a species of wave.

The following is from the Laws of Storms, etc., 1850, p. 504, by the same author:

At the island of Ascension, as well as at St. Helena, there are no storms; but at both places a very heavy swell occasionally sets in which the inhabitants call "rollers."

These rollers are said to come from leeward, which is there the northwestward. There has been much speculation as to what can cause this sudden swell of the sea; some believing it to be owing to volcanic action, and others supposing it to be the ground swell occasioned by distant storms. It is said that the rollers not unfrequently continue for a whole day.

In the narrative of Mr. Williams (a missionary in the South Seas) a similar swell of the sea is described. Speaking of Tahiti, he says: "Mostly once, and frequently twice a year, a very heavy sea rolls over the reef, and bursts with great violence on the shore; but the most remarkable feature in the periodical high sea is that it invariably comes from the west or southwest, which is the opposite direction to that from which the trade wind blows. The eastern sides of these islands are, I believe, uninjured by these inundations."

When the swell, proceeding from a hurricane, rolls against the east side of an island within the Tropics, some part of the storm which causes it will usually pass over that island, but a distant storm may pass on either side, sending only its swell upon the shore.

Mr. F. P. B. Martin, in The Rotary Theory of Storms, 1852, cites an instance of a swell from the west being experienced by a ship far to the south of the center of a storm. As the latter passed eastward the direction of the swell was from the northwest, thereby indicating the direction in which the storm was moving. On page 148 he states that—

The rollers at Ascension and St. Helena, which are stated "to come from leeward," that is to the northwestward, would possibly be formed by the rear right-hand quadrant of a cyclone formed to the westward of those islands, and traveling away from them toward the coast of South America.

Rear Admiral Fitz Roy, in the Weather Book, 1863, pp. 386–387, alludes to the fact that at the Mauritius and in the River Plata, the water usually rises before a storm, while at the same time the barometer is falling.

In the wide but shallow Plata the depth of water and nature of current vary in remarkable accordance with the barometric changes.

Another cause of the water rising before a high wind, or storm, as well as of a ground swell, of rollers, or that of disturbed tumultuous heaving of the sea, sometimes observed while there is little or no wind at a place, is the action of wind on a remote part of that sea; an action or pressure which is rapidly transmitted through a nonelastic fluid to regions at a distance.

In his Handy Book of Meteorology, 1868, p. 267, Mr. A. Buchan, says:

Storm wave of the sea accompanying the hurricane.—Owing to the diminished pressure of the air at the center as compared with what prevails at the outskirts of the storm, the difference being fully two inches of mercury, the level of the sea at the center would be raised about three feet, being sustained at that height by the greater pressure all round. This increase of level, when occurring at high tide, and being increased still further by violent winds blowing in upon the center, quite accounts for the advances made by the sea over the land, especially over the low lying islands, and the heartrending scenes of desolation which it causes.

The storm wave, then, is the destructive wave due to the combined action of the wind, the high tide, and the diminished pressure, or gradient of pressure. Buchan says that in October, 1864, the storm wave at Calcutta rose ten feet above the highest spring tides.

In The Indian Meteorologist's Vade Mecum, 1876, p. 159, Mr. Henry F. Blanford gives the following graphic description of a storm wave and its effects:

The storm wave.—Great as is the destruction of life and property, both on sea and land, wrought by the blast of the hurricane, all such disasters as shipwrecks and homesteads devastated by the wind are utterly overshadowed and eclipsed by the fell sweep of the storm wave. It is probable that every cyclone is accompanied by a storm wave. The reduction of atmospheric pressure at the center of the storm, amounting sometimes to two barometric inches, would of necessity cause a rise of the mean level of the sea, amounting to about 13 inches for each barometric inch of diminished pressure; and, in addition to this, the winds, in virtue of their friction on the sea surface, and the spiral incurvature of their course, must tend to pile up a head of water in the central part of the vortex. But it is only when the wave thus formed reaches a low coast, with a shallow shelving foreshore, such as are the coasts of Bengal and Orissa, that, like the tidal wave, it is retarded and piled up to a height which enables it to inundate the flats of the maritime belt, over which it sweeps with an irresistable onset. As might have been anticipated, the destructiveness in each case depends very much on the phase of the tide at the time of the storm wave's approach, and also on the phase of the moon; since if a storm wave arrives at the time of flood during the height of the spring tides, the effects are cumulative, and the depth of the inundation and the extent of the destruction so much the greater. But if it arrives at the time of low water in the springs, its effects may be to some extent neutralized. Its full effects are most felt on the right of the central track of the cyclone, for the direction of the wind there coincides with the advance of the wave; whereas on the left of the track the wind generally opposes its advance. But the acme of its destructive power is displayed where a broad, shallow river estuary stretches up into the land to the right of the storm track—estuaries, for instance, such as the Hooghly and the Megna, in which the tidal wave is ordinarily heaped up and retarded, forming a *bore*. Under such circumstances, the flats around these estuaries have become the theater of the greatest natural catastrophes recorded in history; for as such they may be estimated, even after due allowance has been made for the imperfection of Indian statistics, and the irresistible tendency of the unscientific mind to exaggerate all great disasters.

Mention has already been made of the storm of the 7th of October, 1737, in which the storm wave is said to have risen to 40 feet in the Hooghly, sweeping away 300,000 souls. In May, 1787, at Coringa, near the mouth of the Godavery, a storm wave is said to have swept away 20,000 souls; and the storm of the 31st of October, 1831, which passed between Balasore and Cuttack, was accompanied by an inundation which destroyed 300 villages and 11,000 people. In the Calcutta cyclone of the 5th of October 1864, the storm wave inundated the flats on both sides of the Hooghly estuary, causing a loss of life, which a subsequent census (in part an estimate only) put at about 48,000 souls and considerably upwards of 100,000 cattle. The height of the storm wave at Cowcolly Lighthouse was 16.48 feet above the level of high spring tides and this was about its greatest rise. At Kidgeree it was 15.9 feet, at the mouth of the Huldi River 10 feet, at Diamond Harbor 11.9 feet, and at the junction of the Roopnarain and Hooghly also 11.9 feet above high spring tide level. The resulting inundation had a depth of from 15 feet downward, over the land surface, and over a tract

from 4 to 10 miles broad, extending from the banks of the river inland; the destruction was extreme.

But even this great disaster was eclipsed by that of Backerganj on the night of the 31st of October and 1st of November, 1876. This was not the first catastrophe of the kind that has ravaged this part of Bengal, even since the beginning of the century. In June, 1822, the flat rice lands about the mouth of the Megna were submerged by a storm wave, and 50,000 souls are said to have perished. But the loss in the recent cyclone was far heavier, and, notwithstanding the great reduction subsequently made on the original estimates of the loss of life (a process which has never been carried out with those of the earlier cyclones), it may probably still rank as one of the most destructive natural catastrophes on record.

In the Indian Meteorological Memoirs, Report of the Vizagapatam cyclone, October, 1876, p. 51, and especially p. 158, Mr. John Eliot attributes storm waves to much the same causes as does Blanford. So, also, does R. H. Scott in his Elementary Meteorology, 1882, p. 375, and likewise Robert deC. Ward in the American Meteorological Journal, 1892, p. 269.

Blanford, Eliot, Scott, and Ward had especially in mind the storm waves that accompany the cyclones of the Indian Ocean.

In the American Meteorological Journal, 1894, p. 498, in an article on "Storms of the Gulf of Mexico and their prediction," Mr. Wilfred D. Sterns, principal of the Rosenberg School, Galveston, Texas, writes as follows:

(1) Twelve hours or more before any other indication of the storm's approach the surf at this point increases in intensity. The sea continues rough until the storm center has passed far to the eastward. Instead of a simple undulation, two distinct wave motions, making an angle with each other of about 60°, may be noted. This system swings as a whole toward the east with the passage of the disturbance in that direction. (2) A great increase in wave length is early noticeable. (3) A marked and quite sudden rise in the tide occurs without wind or a sufficient increase in a favorable wind to account for it. This increase is entirely distinct from the gradual piling up of the water which takes place under the influence of a gentle but constant southeast wind, although a steady wind may produce ultimately an even higher tide.

In the MONTHLY WEATHER REVIEW for May, 1896, p. 154, in an article on "The destructive force of hurricanes and the conditions of safety and danger," Gen. E. P. Alexander writes as follows:

When a hurricane passes inland it soon becomes little more than a bit of very bad weather. Its great instrument of destruction is the so-called tidal wave or storm tide, or more properly, storm wave, which is raised by it, and which submerges the lowlands of the coast. Below the limit to which these waves rise is the zone of danger in a hurricane; above it is the zone of easily attained safety.

How far this danger line may extend above ordinary high water depends so largely upon local configuration of coasts that it is only to be determined for any locality by observation. Unfortunately, reliable measurements and data upon this point are rare and difficult to obtain. Popular accounts are always exaggerated, being largely based upon the action of surface billows, which send water and drift far above the general level of the storm wave. A vessel, for instance, drawing 8 feet, may be carried by successive billows across a marsh submerged only 4 feet below the general level. I have read accounts of combined storm waves and high tides rising 10 or 12 feet above ordinary high water mark, but when the action of billows is eliminated and careful measurements are made, the highest record of a storm tide above ordinary high water which I have been able to find anywhere is 8.2 feet. This limit was reached at Fort Pulaski, Ga., in the great gale of August 27, 1893, which broke all records in the height of its waters, in the destruction of life and property, and in the measured velocity of its winds, which at Charleston, S. C., for a few moments, exceeded 120 miles per hour. As this gale is one of great interest, the reader is referred to the records published in the MONTHLY WEATHER REVIEW for October, 1893, p. 297. The center of the hurricane passed directly over Savannah, Ga., and it will be seen that there the barometer fell lowest and the storm tide rose highest, the wind falling to a dead calm for twenty minutes as the center passed, after which it rose from the opposite quarter. The center passed about 80 miles west of Charleston.

Finally, Ernest K. Roden in his article of December, 1900, above referred to, writes as follows:

So much for the danger arising from the great velocity of the wind and the heavy sea produced by such wind. But wind is not the only destructive element accompanying a cyclone. Another danger is the storm wave that, so to speak, follows the wake of the storm center and at times completes the work of destruction.

The storm wave is of no particular importance to ships that have plenty of sea room; it is the coast cities and fishing communities situated on lowland that will feel its effect when struck by a hurricane advancing from offshore. This was particularly the case at Galveston, Tex. The wind alone would never have caused such loss of life; it might have wrecked a great many less substantially constructed buildings and thereby caused the death of a considerable number of the inhabitants, through their inability to escape from the strange fate of being buried in the ruins of their own homes, but such high figures as are now written on the death list of Galveston would never have been reached by the agency of the wind alone. It was that dangerous ally of the wind, the storm wave, that ran these figures up so high.

By "storm wave" we mean the wave raised by the wind and the atmospheric condition of the hurricane, which by many is erroneously termed the "tidal wave." It should be understood, however, that the storm wave has necessarily no connection with the phenomenon of tides, although it may under certain circumstances, be affected by it. How this storm wave, which hitherto has been given but slight attention, except for its effect, is produced, may possibly prove of interest. It is a fact well known to students of tides and tidal phenomena in general that the atmospheric pressure has a marked effect on the height of tides. When the barometer is low the tides become higher than under normal atmospheric conditions; in other words, a low barometer, or what is the same thing, a less pressure, will produce a higher tide. Applying this theory to cyclones, the cause of the storm wave is readily understood. As previously stated, the atmospheric pressure at the storm center is considerably less than outside of the storm area; consequently, the equilibrium of the water being disturbed by unequal pressure it will be heaped together and rise at the place of least pressure, which is at the center of the hurricane.

The board above referred to formulated the following report:

The board finds no necessity for giving a new meaning or a specific definition to the term "storm wave." Like most other words in the English language it has been used for many years and with a great variety of meanings, each of which has good authority. It would be a work of supererogation for us to attempt to restrict its use to any of these meanings. Indeed, we believe that the compiler of a dictionary of the English language will naturally desire to include all these meanings, and, therefore, we give them in detail as follows:

1. Old nautical usage. The old sailor's term for a heavy wave without a severe wind and evidently due to a storm not far distant. (See Admiral Belcher's Nautical Dictionary of 1867.)

2. Old usage along the Atlantic coast of North America. A long, gentle swell or ground swell felt at any point on the Atlantic coast and which is considered by local seamen to indicate the presence of a hurricane far away to the south or southeast but advancing up the coast. This storm wave or hurricane swell was formerly used in local forecasts by the navigators. It was explained by Redfield about 1833, and is the same as the swell referred to by Reid in 1849 and 1850, and by F. P. B. Martin in 1852.

3. A destructive wave or bore due to the combined effect of high tide and heavy gale sometimes occurring within the dangerous quadrant of a hurricane. (See Reid, 1849.)

4. A theoretical rise or bulging up of the water within the oval region of a very low barometric pressure and due to the greater pressure on the surrounding region of high barometer. This was argued for by Piddington, 1848, and Fitz Roy, 1863, and Buchan, 1868, but has not as yet been actually observed by any one and is in general not separable from the rise due to wind and tide.

5. A destructive wave, overflowing land and buildings and undoubtedly due to the combined effect of strong winds, high tide, and low pressure in a region where the coast lines converge and the water shoals rather rapidly. This is the general usage of to-day, and was adopted by Wilson, 1875, Blanford, 1876, Eliot, 1876, and the Weather Bureau generally as exemplified in the MONTHLY WEATHER REVIEW, 1900, p. 154.

6. This term is not usually confined to the rise of water due to the mere decrease of pressure within a low area as was done by Roden in his article of 1900.

The motion of the surface water within a cyclone is so slow that its contrifugal force will not produce anything more than the slightest and inappreciable scooping out of the water at the center, and no appreciable banking up in a ridge around the periphery.

Again, the diminished atmospheric pressure near the center of a cyclone should allow the ocean water to bulge up or rise to the extent of about one foot for each inch of barometric depression, provided the cyclone stands in one place long enough to allow this pressure to produce its full effect; ordinarily storms move so rapidly that only a small proportionate rise of the water can be thus produced.

No observations have been made or seem to be practicable for determining the actual rise of water within a hurricane on the open ocean. The rise observed at seaports when a hurricane passes near is due principally to the wind and tide, of which an example is given in the diagram exhibited by Gen. E. P. Alexander in the MONTHLY WEATHER REVIEW for May, 1896, who uses the term "tidal wave" or "storm tide" or "storm wave" as representing the total effect of the storm on the water, and, therefore, quite in accord with our definition No. 5.

It is earnestly to be desired that observers learn to distinguish between tidal waves and storm waves. Blanford describes a typical tidal wave under the name of *bore*. (See page 461.)

As has already been pointed out,[1] most of the so-called tidal waves are really storm waves.

Severe waves often accompany earthquakes, as was the case in Lisbon in 1755 and in Japan in 1895; these are not tidal waves, but may be called *earthquake waves*.—*H. H. K.*

ON BAROMETRIC OSCILLATIONS DURING THUNDERSTORMS, AND ON THE BRONTOMETER, AN INSTRUMENT DESIGNED TO FACILITATE THEIR STUDY.[2]

BY G. J. SYMONS, F. R. S.

[Reprinted from the Proceedings of the Royal Society, vol. 48, 1890.]

The fact that a rise of the barometer occurs during thunderstorms has been supposed by many to be newly discovered through the general establishment of self-recording barometers; but Dr. Hellmann has shown that it was noticed by J. J. Planer as far back as 1782. In 1784, Rosenthal epitomised the facts as follows: "When a thunderstorm approaches the place where a barometer is situated, the mercury in the tube begins to rise; the nearer the thunder cloud comes to the zenith of the observer, the higher does the mercury rise, and it reaches its highest point when the storm is at the least distance from the observer. As soon, however, as the cloud has passed the zenith, or has become more distant from the observer, the weight of the atmosphere begins to decrease and the mercury to fall." A few years later, Toaldo determined the amount of the rise in several storms, and found it to be between 1 and 2 lines (0.09 inch to 0.18 inch).

Professor Strehlke (in 1827–1830) made several sets of observations, and found the rise to be from 0.04 inch to 0.06 inch, and was probably the first to point out that the highest point of the barometer is not absolutely synchronous with the passage of the center of the storm-cloud, but seems rather to be always at a certain distance from it.

Kaemtz, in his Lehrbuch (1832), suggests that the rise is produced by the inrush of air toward the site of the storm, this accumulation causing the rise of the barometer as the storm nears the zenith.

Although Luke Howard had a recording barometer at work in the early part of this century, he seems to have failed to notice the phenomenon; and no one in England seems to have been aware of it until the photographic barometer was started at the Radcliffe Observatory, Oxford. Manuel Johnson, when describing the new instruments at the British Association meeting at Glascow, in 1855, said:—

"Among the most remarkable results is a sudden rise of the barometer, amounting to 0.035 inch, and an increase of temperature of 1°, coincident with the occurrence of a thunder clap which struck one of the churches in Oxford, July 14, 1855. A similar phenomenon took place during a thunderstorm on August 23, when the rise of the barometer was still greater, amounting to 0.049 inch, though the thunder clap coincident with this rise was distant."

Mr. Johnson returned to the subject in the volume of Radcliffe Observations for 1857, and gave reproductions of fourteen barograms, but the scale is so compressed (only ¼ inch per hour, and 1½ per inch of mercury) that not much is to be learned from them beyond the fact that falls occur of 0.037 inch, 0.040 inch, and 0.046 inch, and a rise of 0.070 inch; the notes on the storms are also too vague to be useful. It may, however, be well to quote the conclusion at which Mr. Johnson arrived, viz.:—

"A comparison of these notes with the accompanying illustrations cannot, in my opinion, fail to lead to the inference that the disturbances exhibited both on the barometric and the thermometric curves (especially the former) are caused by the presence of electricity in the atmosphere, of which we had on these occasions sensible proof. But they are the more interesting, from the circumstance that similar disturbances occur not unfrequently when there has been no overt manifestation of that agency; especially during the winter months, when, according to the concurrent testimony of all observers, atmospheric electricity is most abundant."

The next observation of importance is one quoted by Le Verrier, as reported to him by the observer, M. Goullon, Curé of Saint-Ruffine (Moselle). He had two barometers, a mercurial and an aneroid. On the morning of February 5, 1866, the weather being stormy with heavy rain, wind southwest, moderate, but not squally, he had just set and read his barometers, when there was a solitary loud clap of thunder, and instantly both his barometers rose 2 millimeters (0.08 inch).

The Hon. Ralph Abercromby began studying these oscillations in 1868, and in 1875 summed up the results in the following sentences, one descriptive, the other explanatory:—

"There are two classes of storms in this country: in the one the barometer rises, in the other it falls. In the case in which it rises, the sequence of weather is somewhat as follows: After the sky has become overcast, the wind hushed to an ominous silence, and the clouds seem to have lost their motion, the barometer begins to rise suddenly. In the middle of this rise, sudden heavy rain begins. After a few minutes the rain, with or without thunder and wind, becomes a little less heavy, and the barometer sometimes falls a little. The rain then continues till the end of the squall, and as it stops the barometer returns to its original level. In Great Britain the rise rarely exceeds 0.10 inch, or lasts more than two hours. These rises are always superadded to a more general rise or fall of the barometer, due either to a cyclone or to one of the small secondaries which are formed on the side of one. During some rises the wind remains unchanged; with others there is a more or less complete rotation of the wind. In all cases the disturbance seems to be confined to the lower strata of the atmosphere."

* * * "Since the rise is always under the visible storm, it is propagated at the same rate and in the same manner as the thunderstorm. Enough is known of the course of the latter for it to be certain that they are not propagated like waves or ripples, and hence these small barometric rises are not due to aerial waves, as has been suggested. Since their general character is the same whether there is thunder or not, it is evident that electricity, even of that intensity which is discharged disruptively, is not the cause of the rise. If we look at a squall from a distance, we always see cumulus above it, which is harder or more intense in the front than in the rear of the squall. Since cumulus is the condensed summit of an ascensional column of air, it is evident that the barometric rise takes place under an uptake of air. If we consider further that a light ascensional current would give rise simply to an overcast sky, a stronger one to rain, while a still more violent one would project the air suddenly into a region so cold and dry that the resulting electricity would be discharged disruptively as lightning, the foregoing observations show that the *greatest rise is under the greatest uptake*. Our knowledge of the mechanics of fluid motion is still too unsettled for us to say with certainty whether or not an ascensional current of air would have a reaction backward, like a jet of air issuing from an orifice."

Professor Mascart also, in 1879, expressed the opinion that electricity had nothing to do with these oscillations, but suggested quite a different explanation. Premising that they are not produced by all heavy rains, but only when heavy showers fall during bright weather, he suggested that at such times rain falls through nonsaturated air, where it would evaporate freely, and so produce a local increase of pressure which, in certain thunder rains, might amount to 2 millimeters (0.08 inch). He explained the diminution of pressure which sometimes occurs, by the reversed phenomenon; he considered that thunderstorms are formed locally, and suggested that the condensation of masses of vapor into rain drops ought to produce a diminution of pressure.

M. Teisserenc de Bort and Mr. Budd have suggested that the rise may be due to the local compression of the air by the multitude of falling rain drops.

In the Annales of the French Meteorological Office for 1880, M. Renou gives reproductions of some barograms from the Observatory at Parc St.-Maur. A very interesting one is reproduced in fig. 1. M. Renou does not append any remarks to the plate; but from other sources it appears that there was a heavy thunderstorm from 10 till 11 p. m. on August 18, 1878. The total rise may be taken as 0.10 inch and the fall as nearly 0.15 inch.

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[1] See MONTHLY WEATHER REVIEW for 1900, Vol. XXVIII, p. 154.

[2] The article on thunderstorms in the MONTHLY WEATHER REVIEW for July, 1901, discusses some questions that deeply interested the late G. J. Symons, founder of the splendid system of British rainfall stations and editor of Symons' Meteorological Magazine. His successor, H. Sowerby Wallis, kindly sends us a special copy of the paper by Mr. Symons which we now reprint as it is undoubtedly but little known to our American observers, some of whom have been "discovering" facts that were known a hundred years ago. A complete review of our knowledge of thunderstorms as it stood in 1893 will be published in the last part of the Proceedings of the Meteorological Congress of Chicago. Meanwhile this memoir of Symons is exceedingly suggestive. The brontometer described therein is still in working order in London and can be purchased for $500. If several of them could be established within 5 miles of each other they would give many of the observational data that are needed by those who wish to investigate the exact phenomena of thunderstorms, hailstorms and tornadoes. We commend it to those sections in which destruction by lightning and hail and wind is sufficient to stimulate the special study of local storms with a view to prediction and protection.—*C. A.*

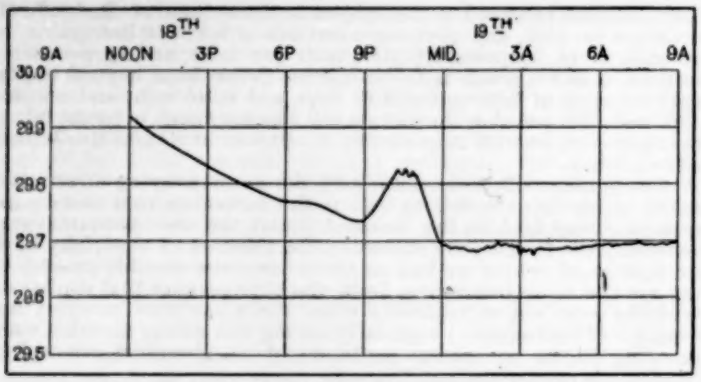

FIG. 1.—Parc St.-Maur, Paris, August, 1878.

Dr. Fines, of Perpignan, established a Redier barograph in 1875, and in a memoir published in 1883 gives reproductions of the traces during several storms. He states that, considering the present imperfect knowledge of the real conditions and origin of thunderstorms, it seems useless to try to explain records frequently influenced by very distant storms. One fact, however, is certain, that thunderstorms are accompanied by great condensation, which must cause variations in the density of the air, and therefore should affect the barometer. He gives 0.144 inch in twenty minutes as the greatest variation, but says that it rarely exceeds 2 or 3 millimeters (0.08 inch or 0.12 inch) in an hour. The only facts which are certain from the records at Perpignan are that there is usually (1) before heavy rain, decrease of pressure and temperature; (2) with the rain, sudden increase of wind, rapid rise of barometer, and fall of temperature; (3) at the end of the storm rain, reversal of the last three phenomena.

Dr. Ciro Ferrari, who has devoted great attention to the progress and character of the thunderstorms of north Italy, considers the rise due to secondaries on the skirts of cyclones.

Professor Börnstein regards them as due to temperature changes not reaching to the upper strata of the atmosphere, in which view he has partly the support of Professor Ferrel.

Professor Klossovsky, of Odessa, says that "Every storm, whether with or without hail, is accompanied by barometric oscillation." If by this phrase he means oscillations like those observed in other parts of Europe, the phenomena must be different in southern Russia, for one of the difficulties in London, for example, is that they do not occur with *all* storms, but only with *some*.

In the Annuaire of the Montsouris Observatory for 1889, M. Descroix, when referring to the subject, gives a barogram for August 15, 1888, which, with the accompanying notes, is so typical that it is reproduced (reduced to the same scale as the others) in fig. 2.

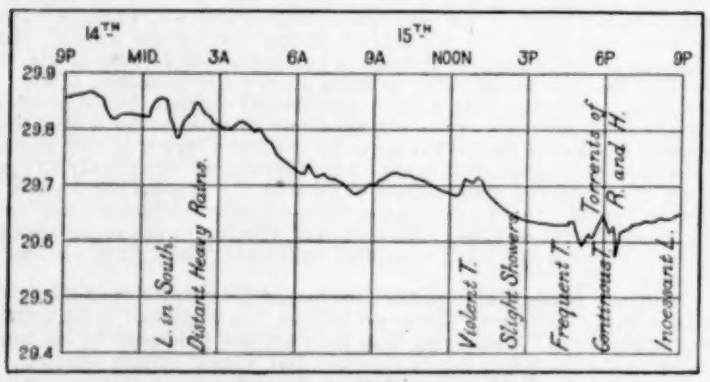

FIG. 2.—Montsouris, Paris, August, 1888.

It will be noticed that several of the opinions above quoted are contradictory, and it is not known that any one explanation is generally accepted.

The author was much struck by the remarkable curve given by his Redier barograph on the evening of August 2, 1879, and still more so when he found that the curve from a similar instrument at Messrs. Lund and Blockleys, in Pall Mall, 2¾ miles south by west from his own instrument, was nearly identical (figs. 3 and 4), and he has long desired to investigate the subject. At last, in 1886, he definitely decided upon the phenomena which he considered it necessary to record mechanically. The author had read the description of Sir Francis Ronald's storm clock, and, the objects being similar, that description was useful, though the completed apparatus has scarcely one feature which even resembles Sir Francis's.

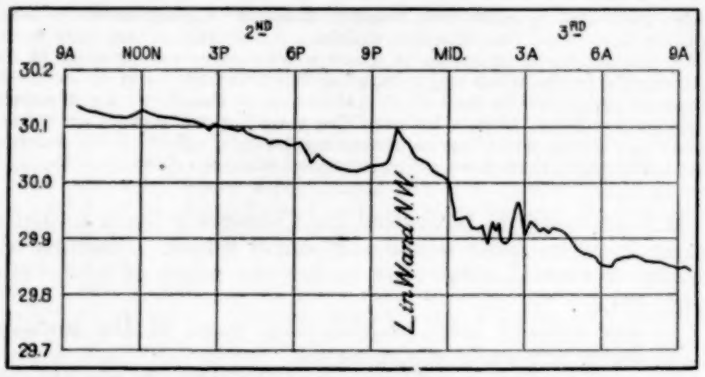

FIG. 3.—Camden Square, London, August, 1879.

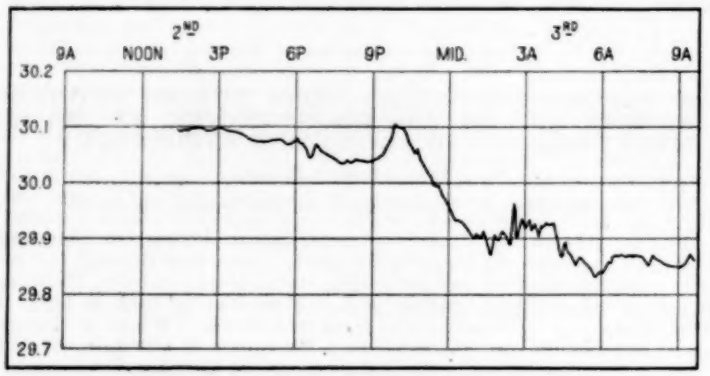

FIG. 4.—Pall Mall, London, August, 1879.

Before describing the instrument, the author considers it only fair to MM. Richard Frères to state that not only has the apparatus been constructed, but almost wholly invented, by them. The author decided upon what the instrument was to do, and upon the scales required, but he left the whole constructional details to MM. Richard, and considers the result a great credit to the firm.

As the primary object of the instrument[1] is the study of the phenomena of thunderstorms, it has, for brevity, been termed a brontometer, or thunderstorm measurer.

It is provided with endless paper 12 inches wide, traveling under the various recording pens at the rate of 1.2 inches per minute, or 6 feet per hour. This is about 150 times faster than is usual in meteorological instruments, and enables the time of any phenomenon to be read off with certainty to a single second of time.

The traces are made in aniline ink by a series of seven Richard pens.

The first pen is driven by the clock which feeds the paper, so that the time scale and the paper must go together. The pen usually produces a straight line, which serves as the base line for all measurements, but at 55 seconds after each minute the pen begins to go, at an angle of about 45°, one-tenth of an inch to the left, and at the sixtieth second it flies back to its original position.

The second pen is driven by one of Richard's anemo-cinemographs, a name which they have given to a pattern of anemometer not yet known in England. The external portion has some resemblance to the ordinary windmill governor, but it differs from it in that the plates are curved, not flat; they are made of aluminium, and are so light that they have little momentum, and have thus a great advantage over cups, which run on for many seconds after the wind force has decreased or ceased. The fans make one revolution for each meter of wind that passes, and send an electric current to the brontometer, where it acts on an electro magnet, and tends to draw this second pen toward the left; but a train of clockwork is constantly tending to draw the pen to the right, the joint result being that the pen continuously shows, not the total motion (as is the case with most anemometers), but the actual velocity almost second by second. It does this certainly with an error of less than five seconds, for the fans will stop dead in less than that time, and the clockwork train will bring the pen from indicating a velocity of 70 miles an hour to 20 miles an hour in three seconds, and down to a dead calm in seven seconds. The trace will thus resemble that of a pressure anemometer, but with a much more open scale than was ever before available.

The third pen is actuated by a handle, and can be set at zero or at 1, 2, 3, or 4 spaces from it. The author's original idea was, partly by watching a storm rain gage, and partly by estimation, to decide on the intensity of the rain and to indicate that intensity by moving the pen

[1]Other uses for it are already apparent.

farther and farther from zero as the fall becomes heavier. Experience alone will show whether that is, or is not, superior to moving it one step for each $\frac{1}{100}$ of an inch of fallen rain, which can be done by making a Crosley rain gage send a circuit into the room where the brontometer is placed, and strike a bell there. In a heavy storm there will, however, be so much for the observer to do that very probably count would be lost. It may, therefore, be necessary to make it act automatically.

The fourth pen is actuated somewhat like a piano. On the occurrence of a flash of lightning the observer presses a key, the pen travels slightly to the right and flies back to zero. Referred to the automatic time scale this gives, to a second, the time at which the key was depressed.

The fifth pen is similar, but being intended to record the thunder, the observer will continue to hold down the key until the roll is inaudible. The time of the departure of this pen from zero will evidently be later than that for the lightning by the time interval due to the distance of the flash, and possibly something may be learned from the accurate record of the duration of the thunder.

The sixth pen is similar to the third, and is intended to record the time, duration, and intensity of hail.

The seventh and last pen is devoted to an automatic record of atmospheric pressure. As the rapid motion of the paper, which is indispensable for studying the details of a thunderstorm, has enlarged the time scale more than a hundredfold, it was imperative that the barometric scale should itself be greatly enlarged. But the range of the barometer in London is more than 2½ inches, and no enlargement less than ten times the natural (mercurial) scale would be of any use; hence a breadth of 25 inches of paper would be necessary unless some mode of shifting the indication could be devised.

Several plans were tried but finally a modification of Richard's statoscope has been adopted, which is so sensitive that it will indicate the opening or shutting of a door in any part of the house, gives a scale of 30 inches for each mercurial inch (i. e., about three times that of a glycerine barometer) and yet only requires 4 inches breadth of the brontometer paper. Without entering into all the details of construction, it is desirable to explain the general principle and its application. As it was essential that the apparatus should record accurately to 0.001 inch of mercurial barometric pressure, it was evident that friction had to be reduced to a minimum, and considerable motive power provided. This is done by placing in the base of the brontometer a galvanized-iron chamber which contains about 3½ cubic feet of air; on the upper part are a series of elastic chambers, similar to the vacuum boxes of the aneroid barometers but much larger.

When the instrument is to be put in action these chambers are connected with the large air chamber, and a tap is closed which shuts off communication with the external air. Any subsequent increase or decrease of atmospheric pressure will compress or allow to dilate the air in these chambers, and the motion of the elastic ones produces that of the recording pen.

Obviously, any large change in the temperature of the confined air would vitiate the readings; but (1) the instrument is not required to give absolute, but merely differential, values, and (2) the influence of the changes of temperature is greatly reduced by the chamber being surrounded with 4 inches thick of nonconducting material, besides nearly 1 inch of wood outside of it. The change of temperature in a room, and during the short time that the statoscope will be worked without resetting to zero (i. e., without opening the tap) has not hitherto produced any measurable effect.

The author hopes, in a subsequent paper, to have the honor of laying before the society the results obtained from this novel apparatus.

APPENDIX.

List of some papers and memoirs on the subject of the paper.

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Assmann. [Interesting reproductions of the Magdeburg barograph curves are given in the] Jahrb. der Meteor. Beob. der Wetterwarte der Magdeburgischen Zeitung. Jahr. 1—5, Magdeburg, 1883–87.

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Hellmann, G Eine historische Bemerkung. Zeits. d. Oesterr. Gesells. f. Meteor. Vol. 19. 1884. P. 43.

Bezold, W. von. Ueber die Vertheilung des Luftdruckes und der Temperatur während grösserer Gewitter. Zeits. d. Oesterr. Gesells. f. Meteor. Vol. 19. 1884. P. 281.

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Ferrel, W. A Popular Treatise on the Winds. 1889.

COLORED SNOW.

A correspondent in Pawpaw, Mich., asks:

Has any one ever investigated the cause of colored snow? Almost every winter we have snowfalls that have a powdery substance that would be almost imperceptible except that it colors the snow quite materially. We had such a phenomenon last Saturday (February 16, 1901). Three years ago a very pronounced black snowfall occurred. I melted a quantity of the snow; the residue was in scaly particles, and, so far as my amateur investigation could determine, it was entirely metallic. I have some of the material from last Saturday's snowfall. It is brown instead of black, but is not yet entirely dry. It has the appearance of being vegetable matter, although the day was so calm that my windmill did not run. We used to call it prairie dust, swept off the western plains, but I am inclined to the belief that it is meteoric—star dust, if you please.

It would be interesting to know the extent of this colored snowfall, and your department, it would seem to me, is the proper one to investigate it.

This phenomenon is not an unusual one, but since none of the numerous voluntary observers in Michigan noted colored snowfall on February 16, 1901, we infer that in this case the fall was confined to a small area, perhaps embracing only two or three townships.

In the New York State Weather Service Report for April, 1889, (see also the MONTHLY WEATHER REVIEW, Vol. XVII, April 1889, p. 89,) is an account of a black snowfall "cover-

ing the counties of Lewis, northern Herkimer, southern Franklin, and the northwestern part of Essex, and probably Hamilton." The sediment consisted principally of finely divided earth or vegetable mold, and no doubt closely resembled that collected by our correspondent at Pawpaw, Mich., on February 16, last.

Colored snow has been observed from very early times. In the American Almanac for 1833, p. 65, is a translation from Pouillet's Meteorologie of 1828 which credits Pliny (Book IX, chap. 35) with the statement that snow becomes red with age, and Mr. Francis Bauer with the discovery that the red color of the snow is due to the growth of "little mushrooms of the genus *uredo*, forming a peculiar species which he calls *uredo nivalis*, because snow is their natural soil."

In the American Journal of Science and Arts for 1841, vol. 41, p. 64, is a synopsis of a communication by Prof. Louis Agassiz on *animals found in red snow*. "He stated that Shuttleworth had lately demonstrated that besides the *Protococcus nivalis*, the red snow contained several species of *infusoria*. The results of Professor Agassiz's observations led him to conclude that the red snow was altogether an animal production, and that the so-called *Protococcus nivalis* is the ova of a species of rotiferous animal called by Ehrenberg *Philodina roseola*. This animalculae he had found dead in the red snow, and abundantly in the ditches in the neighborhood, at the bottom of which its ova produced a red deposit. Under the microscope the colored ova in the ovaries could be distinctly observed. He has also seen the infusoria described by Shuttleworth."

From the same journal for 1852, 2d series, Vol. XIII, p. 442, we quote the following: "Observations on a red snow which fell in Switzerland on the 3d and 4th of February;" by M. Ehrenberg. (Monatsber. Berlin Acad., March 6:)

This red snow covered a large extent of country, including the cantons and districts of Zurich, Berne, Schwyz, Lugano, Bergamo, and Milan. It afforded a red precipitate, which yielded on analysis a large quantity of lime and silica, a little alumina, and some iron and magnesia. Microscopically examined, it was found by Ehrenberg to contain sixty-three organic forms, allied to those heretofore found by him in atmospheric dust, without any marine species.

In his American Weather, p. 74, Gen. A. W. Greely has the following to say of Arctic snows:

Green and red snow are to be found in a few parts of the world, principally in the Arctic regions, the color being due to minute organisms called *Protococcus nivalis*. The most extensive deposits of red snow known, situated near Cape York, Greenland, were discovered by Capt. John Ross, R. N., in 1818, from whom the hills, owing to this snow, received the fanciful name of Crimson Cliffs. The color, however, as seen by the author, is a faint, dirty, dull red, and not crimson.

The MONTHLY WEATAER REVIEW for March, 1879, p. 16, states that—

A microscopic examination of the yellow snow which fell at South Bethlehem, Pa,, on the 16th of that month disclosed the fact that the color was due to the presence of the pollen of pine trees that were then in bloom throughout the States farther south.

An extensive investigation of the black snow of January, 1895, will be found in the MONTHLY WEATHER REVIEW for that month (Vol. XXIII, pp. 15–19), wherein it is shown that the black or brown snow was colored by the fine soil blown along on the gales that accompanied the storm.

In the same journal for August, 1901, p. 374, it has been shown that the autumn haze is undoubtedly due to the finest dust—

Composed of one or all of the following substances, namely, fine particles of soil or the dead leaves of plants, or ashes from wood fires, salt from the ocean spray, the shells or scales from microscopic silicious diatoms, germs of fungi, spores of ferns, pollen of flowers, etc.

Aqueous vapor utilizes these minute dust particles as nuclei about which to condense, but they would of themselves hardly be sufficient to explain the dark color of the snowflakes. If, however, after the snowflakes had formed they fell through or with a cloud of dust, smoke, pollen, or any other powdery substance, the powder would no doubt settle with them and impart its own peculiar color to the fallen snow.

It thus appears that the colored snowfalls occasionally noted are to be attributed, not to meteoric dust, but to dust taken up into the air from the surface of our own planet. There is only one case fairly well established where the snow was darkened by dust (iron) that had come from outside the atmosphere. The minute organisms that sometimes impart color to the snow, and particularly in Arctic regions, require time for their development, and we would hardly expect them to be numerous in newly-fallen snow, although they undoubtedly multiply with great rapidity.—*H. H. K.*

ELECTRICAL PHENOMENA; INCANDESCENT CLOUDS.

In a letter dated Braidentown, Fla., August 28, 1901, Mr. H. H. Ten Broeck sends the following account of electrical phenomena observed by him:

About 9 p. m. of May 30, 1901, I saw some clouds pulsating with light like that of an aurora. They were small and very thin, showing stars through them, and drifting slowly eastward, overhead. On turning from them for a few moments and looking at them again, I was surprised to find them almost invisible. In a few moments they became plainer, and I saw they were lambent like the streamers of an aurora. I watched them for several minutes, during which they varied in light about every fifteen seconds. I then noted a larger, much denser cloud about west-northwest 20°, which showed the same action of auroral light. A bank of clouds covered the whole northern sky to some 20° above the horizon; they were very bright, but showed no variation in their light. A few scattered clouds in the south also were free from variation. There was nowhere any trace of streamers. A violent storm followed the next night, which in eighteen hours discharged nearly 7 inches of rain, a very unusual amount for the time of year. I have nowhere seen its equal in nine years.

I have also noted more lightning without thunder. I reported some instances a few months ago in the MONTHLY WEATHER REVIEW. I saw a flash recently going from one cloud to another. It was about two miles long and very bright. I expected a violent clap of thunder, but none came. I have often seen such discharges followed by loud thunder which sometimes lasts over a minute before it dies away.

The preceding observations by Mr. Ten Broeck seem especially interesting because they harmonize with several similar experiences by the Editor. Any one may frequently observe, at night during a storm, clouds floating along and becoming now bright and now dark—the different parts of the same cloud may be bright and dark alternately. It will be easy to perceive thereby that this cloud light is not reflected from terrestrial sources. There seems but one explanation: the cloud is under the influence of an electrical discharge and is rendered luminous by it. Either the cloud particles are incandescent, as in the ordinary incandescent electric light, or the air between the particles is incandescent, as in intense lightning and the ordinary arc lights; in either case we may speak of an *incandescent cloud*, as distinguished from the "phosphorescent," "iridescent," "fluorescent," "luminescent" clouds that have been observed very high in the atmosphere and which apparently become luminous by reflecting distant twilight.

Of the above four terms applied to these clouds, phosphorescent best describes the pure soft, pearly white tint, but for fear lest some may imagine that the presence and oxidation of phosphorous causes the light, the Editor prefers to use the term "pearly" cloud.

Now the incandescent cloud is certainly a true case of incandescence and merits spectroscopic study. It is also a step or phase in the series of phenomena that includes the aurora and the lightning, and, therefore, ought to be recorded by every voluntary observer. As the Editor has often shown, an auroral region is generally surrounded by regions in which

thunderstorms are taking place, but vice versa, thunderstorms are not necessarily accompanied by auroras, though they are attended on their outskirts by incandescent clouds and if clouds are wanting by discharges on telephone, telegraph and kite wires.—*C. A.*

FAKE FORECASTS.

From the Portland Telegram of November 7, 1901, we learn that many of the inhabitants of the town of Woods, on Nestucca Bay, Oreg., were greatly excited over the prediction by a local prophet of "a great tidal wave" for November 3, that was to sweep over the strip of low coast to the mountains, carrying destruction in its path. The absurdity of such forecasts should at once be apparent, since waves properly designated as *tidal* are entirely dependent upon the character of the tides, whether spring or neap, and full information in regard to them is published months in advance by the United States Hydrographic Office. Storm waves, on the other hand, are a phenomenon accompanying severe storms, which latter almost never approach our coasts without ample warning from the United States Weather Bureau. We are, therefore, in danger of being taken unawares by earthquake or seismic waves only, and no one is as yet able to forecast these except possibly a few hours ahead, as when the operators of telegraphs and cables notify each other. An ocean wave produced by an earthquake on the coast of Japan or in the Philippines would require several hours to reach the American coast, and its arrival might safely be anticipated after receiving cablegrams announcing the passage of the earthquake itself. See the MONTHLY WEATHER REVIEW, November, 1895, p. 424, "The Storm Wave at Sausalito," where the speed of earthquake ocean waves is given.

Newspapers must be allowed the freedom of printing whatever they choose, but certainly the public may learn to read these thrilling fake predictions of storms and waves with perfect equanimity.

But these predictions appear in a different aspect when they issue from a voluntary observer of the United States Weather Bureau. The province of a voluntary observer is to observe, record, and report, but not to predict. The moment he appears before the public with a forecast of waves or of earthquakes, that moment he endangers his position as observer. It is possible that the Weather Bureau may need him and employ him as an "official forecaster" if he has great gifts in that line, but it is not probable that it will ever recognize him as a "voluntary forecaster." Is there not an explicit statute dealing with nonofficial forecasters?—*C. A.*

PROF. LUIGI PALAZZO.

By a royal decree, dated July 28, 1901, Prof. Luigi Palazzo was appointed Director of the Central Office of Meteorology and Geodynamics at the Colegio Romano, Rome, Italy, as a result of the competition proclaimed by the Minister of Agriculture, to fill the position made vacant by the retirement of the eminent Prof. Pietro Tacchini, who founded and directed said office with so much success for more than twenty years.

CORRIGENDA.

MONTHLY WEATHER REVIEW for September, 1901, p. 410, column 1, line 22, for "material" read "cloud observations;" line 23, for "observations" read "these."

THE WEATHER OF THE MONTH.

By ALFRED J. HENRY, Professor of Meteorology.

CHARACTERISTICS OF THE WEATHER FOR OCTOBER.

The chief characteristics of the month were dryness and clear skies. From the 18th to the 26th the skies were clear in all parts of the country, and there was practically no rainfall, except on the southeastern coast of Florida and locally in Upper Michigan. During this time an area of high pressure covered the country, stretching from the Atlantic to the Pacific. It is very unusual to chart the weather conditions of the United States for a single day without recording a trace of rainfall in any portion, and still more remarkable that an entire week should pass without a measurable amount of rain falling, except on the southeastern coast of Florida and a few sprinkles in Upper Michigan.

PRESSURE.

The distribution of monthly mean pressure is graphically shown on Chart IV and the numerical values are given in Tables I and VI.

Monthly mean pressure was highest over the Appalachian region in West Virginia, Virginia, the western portion of North Carolina, and eastern Tennessee; it was lowest north of Montana and over the Southwest. As compared with monthly mean pressure for the previous month, there was a marked rise, amounting in some cases to two-tenths of an inch and over. The greatest change occurred in the middle Rocky Mountain region and generally throughout the Southwest. Monthly mean pressure was one-tenth of an inch above normal from the Ohio Valley eastward to the Atlantic coast. It was also generally above the normal in the remaining districts east of the Rocky Mountains. The only negative departures recorded during the month were on the north Pacific coast and in the Plateau region.

TEMPERATURE OF THE AIR.

The distribution of monthly mean surface temperature, as deduced from the records of about 1,000 stations, is shown on Chart VI.

The month was warmer than usual in practically all districts. The greatest positive departures were noted in Montana and the British Possessions. Positive departures of from 4° to 6° were also recorded from the Mississippi Valley westward to the eastern foothills of the Rocky Mountains and on the northern Plateau and north Pacific coast. Negative departures were recorded at less than a dozen stations and the deficiencies in these cases were generally less than a degree.

The average temperature for the several geographic districts, and the departures from the normal values are shown in the following table:

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
		°	°	°	°
New England	10	51.6	+ 1.4	+ 2.2	+ 0.2
Middle Atlantic	12	56.3	+ 0.5	+ 1.8	+ 0.2
South Atlantic	10	64.0	+ 0.4	− 9.3	− 0.9
Florida Peninsula	7	73.7	+ 0.6	−12.7	− 1.3
East Gulf	7	67.0	+ 0.2	− 8.1	− 0.8
West Gulf	7	69.4	+ 2.3	+ 9.0	+ 0.9
Ohio Valley and Tennessee	12	58.6	+ 1.7	− 1.8	− 0.2
Lower Lake	8	52.9	+ 1.6	+ 3.6	+ 0.4
Upper Lake	9	49.8	+ 2.9	+13.8	+ 1.4
North Dakota	8	48.1	+ 4.6	+27.9	+ 2.8
Upper Mississippi Valley	11	56.4	+ 3.7	+19.7	+ 2.0
Missouri Valley	10	57.1	+ 4.6	+31.0	+ 3.1
Northern Slope	7	50.9	+ 4.8	+21.2	+ 2.1
Middle Slope	6	59.3	+ 4.0	+17.8	+ 1.8
Southern Slope	6	65.5	+ 4.0	+11.8	+ 1.2
Southern Plateau	15	60.6	+ 1.5	+ 3.8	+ 0.4
Middle Plateau	9	52.8	+ 4.0	+12.5	+ 1.2
Northern Plateau	10	53.5	+ 5.8	+14.6	+ 1.5
North Pacific	9	56.5	+ 5.0	− 3.8	− 0.4
Middle Pacific	5	61.9	+ 3.5	− 1.1	− 0.1
South Pacific	4	64.6	+ 1.1	+ 2.4	+ 0.2

In Canada Prof. R. F. Stupart says:

The mean temperature of October was higher than average throughout the dominion, except, perhaps, in the outlying northern districts of Ontario and Quebec. From Lake Superior westward to the Pacific the departure exceeded 3°, and from Lake Superior eastward to the Maritime Provinces it was generally between average and 3° above. The greatest departures, some 6° or 7° above average, occurred in southern Alberta and western Assiniboia.

PRECIPITATION.

The month was abnormally dry in 15 out of the 21 districts into which the country has been divided. The districts having more than the seasonal rainfall were: the west Gulf States, 125 per cent of the normal; North Dakota, 132 per cent; Missouri Valley, 111 per cent; middle slope, 115 per cent; southern Plateau, 136 per cent; south Pacific, 183 per cent. In the remaining portions of the country the monthly rainfall varied from 33 per cent in Florida to generally under 75 per cent in the remaining districts. A remarkably heavy local rain fell at Galveston, Tex., on the 8th slightly over 14 inches being recorded from 8 p. m. of the 7th to 8 p. m. of the 8th.

Average precipitation and departure from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		*Inches.*	*Inches.*
New England	10	2.36	59	−1.6	−1.2
Middle Atlantic	12	1.49	45	−1.8	−2.6
South Atlantic	10	1.34	35	−2.5	−0.8
Florida Peninsula	7	1.55	33	−3.2	+2.6
East Gulf	7	1.48	53	−1.3	−1.2
West Gulf	7	3.51	125	+0.7	−8.5
Ohio Valley and Tennessee	12	1.03	39	−1.6	−8.7
Lower Lake	8	1.58	51	−1.5	−2.5
Upper Lake	9	2.64	87	−0.4	−5.2
North Dakota	8	1.64	132	+0.4	+1.6
Upper Mississippi Valley	11	1.62	64	−0.9	−8.7
Missouri Valley	10	1.97	111	+0.2	−4.5
Northern Slope	7	0.37	48	−0.4	+1.2
Middle Slope	6	1.52	115	+0.2	−5.3
Southern Slope	6	1.20	71	−0.5	−4.0
Southern Plateau	15	1.13	136	+0.3	+1.2
Middle Plateau	9	0.97	100	0.0	+0.3
Northern Plateau	10	0.55	41	−0.8	−1.9
North Pacific	9	3.05	63	−1.8	−1.9
Middle Pacific	5	1.52	94	−0.1	+0.3
South Pacific	4	1.32	183	+0.6	+2.6

Light flurries of snow fell throughout New England, the northern portion of the Middle States, the Lake region, the upper Mississippi and Missouri valleys, and in the mountain regions of the West. A measurable amount of snow also fell in northern New England and at some of the higher stations in the Catskills and Adirondacks, in upper Michigan, and also on the higher elevations of the Rocky Mountain region, as well as along the Sierras in California and the Cascades in Oregon and Washington.

HAIL.

The following are the dates on which hail fell in the respective States:

Arizona, 20, 22, 30. Colorado, 6, 10, 27. Idaho, 29. Illinois, 13. Indiana, 3, 13. Iowa, 10, 12, 15, 16, 30. Kansas, 3, 10, 11, 12, 13, 27, 28. Kentucky, 14. Michigan, 1, 2, 3, 4, 5, 13, 14, 16, 17, 30. Minnesota, 11, 16, 28, 29. Missouri, 12, 16. Nebraska, 7, 8, 10, 12, 13, 27, 28, 30, 31. Nevada, 1, 2, 3, 4, 19, 26, 27, 28. New Mexico, 5, 6, 30, 31. New York, 3, 18. North Dakota, 11, 29. Ohio, 13, 14, 17. Pennsylvania, 3, 14, 17. South Dakota, 12. Tennessee, 14. Utah, 6, 26, 27, 28. Washington, 29, 30. Wisconsin, 3, 13, 29, 30, 31. Wyoming, 4, 6, 24, 25, 27, 28, 30.

SLEET.

The following are the dates on which sleet fell in the respective States:

Arizona, 29. California, 1, 24, 25, 26, 27, 28. Colorado, 6, 7, 10, 12, 25, 27, 28. Illinois, 13. Indiana, 3. Iowa, 13, 15, 16, 30. Michigan, 1, 2, 3, 4, 16, 17. Missouri, 13. Nevada, 1, 2, 28. New Mexico, 21, 22. North Dakota, 11, 12, 26. South Dakota, 12, 15. Utah, 27, 28, 29. West Virginia, 14, 17. Wyoming, 11.

In Canada Professor Stupart says:

The precipitation has been for the most part light, and in southern Ontario and also in Manitoba and the Northwest Territories particularly so, being less than 1 inch. The only portions of the Dominion where the average was reached or slightly exceeded were southern and eastern Nova Scotia, nearly the entire Province of Quebec, and portions of Ontario lying north of Lakes Huron and Superior; nowhere were any exceptionally heavy amounts recorded. Flurries or light falls of snow occurred locally in all the provinces, except the lower levels in British Columbia.

HUMIDITY.

The averages by districts appear in the subjoined table:

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
	%			%	
New England	77	− 1	Missouri Valley	68	+ 3
Middle Atlantic	73	− 1	Northern Slope	67	+ 9
South Atlantic	75	− 2	Middle Slope	65	+ 7
Florida Peninsula	79	− 1	Southern Slope	66	+ 4
East Gulf	69	− 3	Southern Plateau	46	− 2
West Gulf	72	+ 1	Middle Plateau	54	+ 9
Ohio Valley and Tennessee	72	+ 2	Northern Plateau	62	0
Lower Lake	70	− 3	North Pacific Coast	84	− 1
Upper Lake	77	0	Middle Pacific Coast	67	− 4
North Dakota	75	+ 5	South Pacific Coast	71	+ 2
Upper Mississippi	68	− 2			

SUNSHINE AND CLOUDINESS.

The distribution of sunshine is graphically shown on Chart VII, and the numerical values of average daylight cloudiness, both for individual stations and by geographical districts, appear in Table I.

The averages for the various districts, with departures from the normal, are shown in the table below:

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	4.6	−0.9	Missouri Valley	4.2	+0.3
Middle Atlantic	3.8	−1.0	Northern Slope	3.4	−0.8
South Atlantic	2.9	−1.1	Middle Slope	3.8	+0.7
Florida Peninsula	4.8	+0.1	Southern Slope	4.2	+1.4
East Gulf	2.4	−1.2	Southern Plateau	2.8	+0.8
West Gulf	3.1	−0.5	Middle Plateau	4.1	+0.9
Ohio Valley and Tennessee	3.1	−1.4	Northern Plateau	3.9	−1.2
Lower Lake	4.9	−0.9	North Pacific Coast	6.1	+0.2
Upper Lake	5.6	−0.5	Middle Pacific Coast	4.2	+1.0
North Dakota	4.1	−1.0	South Pacific Coast	3.2	+0.2
Upper Mississippi	3.9	−0.5			

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IV, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—Reports of 1,218 thunderstorms were received during the current month as against 1,533 in 1900 and 2,629 during the preceding month.

The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 1st, 123; 2d, 203; 30th, 116.

Reports were most numerous from: Kansas, 143; Nebraska, 132; Iowa, 130.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz: 23d to 31st.

In Canada: Thunderstorms were reported as follows: Father Point, 30; Quebec, 2, 30; Toronto, 3; White River, 31; Parry Sound, 1, 12, 30; Port Arthur, 29; Medicine Hat, 30; Banff, 17; Hamilton, Bermuda, 3, 11, 12.

Auroras were reported as follows: Father Point, 19; Bissett, 1; Toronto, 24; Port Arthur, 22; Minnedosa, 16; Qu'Appelle, 7; Prince Albert, 18, 19; Westminster, 5; Barkerville, 8.

WIND.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Block Island, R. I.	19	52	w.	Havre, Mont.	29	50	sw.
Buffalo, N. Y.	5	56	w.	Independence, Cal.	28	54	w.
Do.	19	50	sw.	Mount Tamalpais, Cal.	23	58	s.
Chicago, Ill.	11	50	s.	Do.	28	57	nw.
Do.	18	50	sw.	Do.	29	50	nw.
Cleveland, Ohio	12	50	se.	New York, N. Y.	6	59	nw.
Do.	17	56	w.	Toledo, Ohio	12	52	se.
Detroit, Mich.	12	56	s.				

DESCRIPTION OF TABLES AND CHARTS.

By ALFRED J. HENRY, Professor of Meteorology.

For description of tables and charts see page 426 of REVIEW for September, 1901.

TABLE I.—*Climatological data for Weather Bureau Stations, October, 1901.*

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.									Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.					Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Mean actual, 8 a. m. + 8 p. m. + 2.	Mean reduced.	Departure from normal.	Mean max. + mean min. + 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.				Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.					
New England.							51.6	+ 1.4										77	2.36	— 1.6								4.6		
Eastport	76	69	74	29.99	30.08	+ .07	48.0	+ 1.2	64	31	54	32	26	42	21	44	41	80	1.72	— 2.4	9	7,316	sw.	35	n.	19	13	5	13	5.4	0.1
Portland, Me	103	81	117	29.95	30.06	+ .02	50.4	+ 1.3	72	23	58	31	29	42	29	45	41	77	3.12	— 0.8	10	6,801	sw.	32	nw.	18	12	10	9	5.3	T.
Northfield	876	15	65	29.16	30.11	+ .07	45.7	+ 2.4	71	11	57	19	29	34	37	40	37	78	1.52	— 0.8	13	6,759	s.	44	nw.	23	7	12	12	6.1	0.3
Boston	125	115	181	29.98	30.12	+ .07	54.4	+ 2.5	76	23	63	35	25	46	28	49	46	77	3.02	— 1.3	5	7,875	sw.	36	sw.	19	17	8	6	4.1	
Nantucket	12	43	85	30.13	30.14	+ .07	54.8	+ 2.2	70	2	60	38	25	50	18	51	47	78	0.44	— 3.5	6	10,146	sw.	39	nw.	6	15	8	8	4.7	
Block Island	26	11	70	30.11	30.14	+ .04	54.5	+ 0.9	69	10	60	36	26	48	21	50	46	78	3.44	— 1.0	6	11,361	nw.	52	w.	19	17	10	4	3.5	
Narragansett	.....	10	.....	.....	.....	.....	51.9	— 0.4	70	2	61	31	25	43	28	.....	.....	.....	2.64	— 2.1	6	.....	sw.	.....	.....	.....	19	7	5	.....	
New Haven	106	117	140	30.08	30.15	+ .08	53.3	+ 0.9	76	23	65	31	26	44	30	48	44	76	2.95	— 1.1	7	6,423	n.	36	sw.	19	22	6	3	3.2	T.
Mid. Atlan. States.							56.3	+ 0.5										73	1.49	— 1.8								3.8		
Albany	97	102	115	30.03	30.14	+ .08	52.2	+ 1.6	78	23	62	29	29	42	33	46	41	74	2.48	— 0.7	6	5,714	s.	30	se.	13	17	10	4	4.3	
Binghamton	875	79	90	.....	.....	.....	50.4	+ 2.3	75	23	61	27	26	40	38	.....	.....	.....	1.46	— 1.4	6	4,339	w.	26	s.	13	12	11	8	4.8	T.
New York	314	108	350	29.92	30.15	+ .07	56.0	+ 1.0	75	23	64	38	25	49	24	50	44	69	2.20	— 1.3	5	9,375	nw.	59	nw.	6	17	9	5	3.7	
Harrisburg	374	94	104	.....	.....	.....	54.8	+ 2.3	79	23	65	34	26	45	36	.....	.....	.....	1.15	— 1.9	4	4,331	nw.	30	nw.	17	12	14	5	4.2	T.
Philadelphia	117	168	184	30.06	30.18	+ .08	57.1	+ 1.3	81	23	66	38	25	48	30	50	44	69	1.51	— 1.4	7	7,046	sw.	30	nw.	18	19	7	5	3.4	
Scranton	805	111	119	29.30	30.18	+ .11	51.9	.....	76	23	62	30	25	41	38	45	39	70	1.11	.....	7	5,159	sw.	33	sw.	19	12	9	10	5.0	
Atlantic City	52	68	76	30.12	30.17	+ .10	55.9	— 0.4	78	23	63	36	25	48	27	52	49	78	1.18	— 2.1	4	7,617	sw.	34	sw.	19	15	12	4	3.5	
Cape May	17	47	51	30.18	30.20	+ .12	57.5	— 1.4	73	23	64	41	7	51	23	52	....	...	0.87	— 2.7	2	6,019	n.	27	w.	18	16	11	4	3.6	
Baltimore	133	68	82	30.04	30.17	+ .08	56.7	— 0.2	81	23	66	37	26	47	35	49	44	70	1.52	— 1.5	5	3,074	se.	19	w.	23	20	5	6	3.6	
Washington	112	59	76	30.07	30.19	+ .09	55.6	— 0.6	85	23	68	32	26	44	42	49	44	75	0.97	— 2.1	5	4,064	nw.	26	nw.	24	19	6	6	3.1	
Cape Henry	.....	5	59	.....	.....	.....	61.6	— 0.2	81	23	68	42	26	55	26	.....	.....	.....	1.73	— 2.0	5	10,045	ne.	44	n.	17	11	17	3	4.4	
Lynchburg	681	83	88	29.44	30.17	+ .08	57.0	— 0.1	84	23	71	32	26	43	40	49	45	77	0.48	— 2.8	2	2,199	nw.	20	nw.	17	24	6	1	2.3	
Norfolk	91	102	111	30.09	30.19	+ .10	61.0	+ 0.4	80	23	68	42	26	54	26	55	52	78	2.34	— 1.5	4	5,909	ne.	26	nw.	17	15	11	5	3.8	
Richmond	144	82	90	.....	.....	.....	59.1	.....	83	23	70	37	26	48	34	.....	.....	.....	0.79	.....	4	3,169	n.	19	nw.	17	19	8	4	3.1	
S. Atlantic States.							64.0	+ 0.4										75	1.34	— 2.5								2.9		
Charlotte	773	68	76	29.36	30.18	+ .10	60.8	+ 0.5	84	1	72	38	26	50	30	52	47	67	1.04	— 2.6	2	4,217	ne.	20	s.	12	24	6	1	1.8	
Hatteras	11	17	36	30.15	30.16	+ .10	65.3	+ 0.8	78	•	70	51	26	61	17	61	59	84	0.81	— 5.4	4	10,019	n.	38	n.	18	22	5	4	2.5	
Kittyhawk	8	12	30	.....	.....	.....	64.6	+ 1.0	78	13	70	46	19	60	22	.....	.....	.....	1.98	— 1.7	3	.....	ne.	.....	.....	.....	25	4	2	2.4	
Raleigh	376	93	101	29.80	30.20	+ .12	60.3	+ 2.3	83	23	71	38	26	49	31	54	50	75	1.62	— 1.7	6	3,698	n.	20	ne.	3	24	3	4	2.4	
Wilmington	78	82	90	30.08	30.17	+ .10	63.8	+ 0.3	82	24	73	43	26	54	28	57	54	78	2.69	— 1.2	5	5,491	ne.	23	ne.	29	17	12	2	3.1	
Charleston	48	14	92	30.10	30.15	+ .08	66.7	0.0	84	23	74	50	19	59	28	60	56	75	0.86	— 3.3	7	8,252	ne.	28	ne.	7	15	10	6	3.8	
Columbia	351	114	122	29.80	30.17	+ .10	63.1	— 0.5	86	1	74	38	19	52	34	54	48	65	0.47	— 1.9	5	5,491	ne.	22	w.	17	19	9	3	3.0	
Augusta	180	89	108	29.97	30.17	+ .09	63.2	— 0.5	86	1	75	39	19	52	36	55	51	76	1.61	— 0.9	4	3,953	nw.	24	nw.	14	24	4	3	1.9	
Savannah	65	79	89	30.07	30.13	+ .05	66.8	+ 0.4	86	1	75	50	15	58	30	59	55	75	0.98	— 2.6	5	5,206	ne.	20	ne.	29	18	11	2	2.8	
Jacksonville	43	69	84	30.05	30.10	+ .07	69.5	— 0.2	84	1	77	51	15	62	27	63	61	81	1.37	— 3.8	8	6,321	ne.	24	ne.	5	10	13	8	5.0	
Florida Peninsula.							76.7	+ 1.0										79	2.74	— 2.9								4.8		
Jupiter	28	13	55	29.96	29.99	+ .04	77.4	+ 2.0	88	2	82	66	18	72	15	72	70	79	7.08	— 2.1	24	10,885	ne.	36	ne.	7	5	20	6	5.7	
Key West	22	43	50	29.95	29.97	+ .03	78.8	+ 0.3	88	1	82	72	23	76	11	73	71	78	0.79	— 4.5	9	11,040	ne.	35	ne.	6	14	13	4	4.4	
Tampa	34	60	67	30.01	30.05	+ .04	73.8	+ 0.7	88	1	82	58	17	65	23	66	64	81	0.36	— 2.1	4	4,931	n.	19	n.	15	12	13	6	4.3	
East Gulf States.							67.0	+ 0.2										69	1.43	— 1.3								2.4		
Atlanta	1,174	190	216	28.94	30.18	+ .07	61.8	— 0.4	80	2	72	41	15	52	24	52	45	61	0.59	— 1.7	3	7,911	nw.	33	se.	1	23	6	2	2.4	
Macon	370	93	99	.....	.....	.....	62.6	.....	82	1	74	41	15	51	35	.....	.....	.....	1.59	.....	4	4,513	n.	24	ne.	29	24	1	6	2.1	
Pensacola	56	78	96	.....	.....	.....	69.4	+ 0.2	84	2	77	47	15	61	24	.....	.....	.....	3.21	— 0.1	3	7,107	ne.	30	n.	3	23	4	4	2.5	
Mobile	57	88	96	30.07	30.13	+ .09	67.0	— 0.4	84	2	78	44	15	56	30	58	54	72	0.73	— 2.7	3	4,676	n.	29	nw.	3	26	2	3	2.1	
Montgomery	223	100	112	29.92	30.16	+ .09	64.9	— 0.3	85	2	76	41	15	54	32	56	51	70	0.22	— 2.1	5	5,074	e.	24	sw.	12	23	4	4	2.3	
Meridian	375	84	98	.....	.....	.....	62.8	+ 0.6	86	1	76	36	15	49	36	.....	.....	.....	1.08	— 0.3	4	3,129	e.	23	w.	12	21	7	3	2.4	
Vicksburg	247	65	76	29.87	30.13	+ .05	67.4	+ 2.1	87	2	78	46	15	57	28	58	53	70	1.57	— 1.0	4	4,088	e.	20	sw.	12	22	5	4	2.6	
New Orleans	51	88	121	30.07	30.13	+ .11	70.0	+ 0.2	86	2	77	53	15	63	22	61	57	71	2.67	— 0.5	5	5,682	ne.	25	n.	14	19	9	3	2.9	
Port Eads	.....	27	...	.....	.....	.....	73.0	— 0.2	83	•	79	59	•	67	18	.....	.....	.....	1.78	— 2.1	6	.....	ne.	.....	.....	...	12	15	4	4.8	
West Gulf States.							69.4	+ 2.3										72	3.51	+ 0.7								3.1		
Shreveport	249	77	84	29.88	30.14	+ .08	67.2	+ 1.9	93	2	79	42	14	56	30	60	57	80	2.75	— 0.4	3	3,717	se.	24	ne.	11	18	10	3	2.8	
Fort Smith	457	79	94	29.64	30.12	+ .07	66.0	+ 4.9	90	1	78	37	14	54	36	56	50	68	1.98	— 0.8	5	5,534	ne.	38	nw.	12	14	15	2	3.4	
Little Rock	357	93	100	29.77	30.16	+ .09	64.8	+ 2.5	85	1	75	39	14	54	30	56	51	69	1.59	— 0.9	4	3,804	nw.	28	nw.	12	21	3	7	3.0	
Corpus Christi	18	48	53	30.07	30.09	+ .06	74.6	+ 2.1	91	2	80	62	14	69	21	68	65	77	0.42	— 1.8	2	7,348	se.	24	n.	13	18	12	1	2.4	
Fort Worth	670	106	114	29.39	30.10	+ .05	70.4	.....	90	1	81	44	14	59	32	60	54	65	1.90	.....	3	7,464	s.	36	n.	11	13	17	1	3.5	
Galveston	54	106	112	30.04	30.09	+ .06	72.7	+ 0.4	86	2	77	59	14	69	14	66	63	75	15.00	+10.8	4	8,258	e.	42	e.	8	22	6	3	2.9	
Palestine	510	73	79	29.59	30.13	+ .08	68.0	+ 1.5	90	2	78	42	14	58	28	59	55	73	2.70	— 0.5	3	4,286	e.	24	n.	8	18	11	2	3.1	
San Antonio	701	67	77	29.36	30.09	+ .06	72.2	+ 2.5	94	2	84	45	14	61	33	61	56	66	0.12	— 1.6	2	4,643	se.	26	ne.	8	15	10	6	3.9	
Ohio Val. & Tenn.							58.6	+ 1.7										72	1.03	— 1.6								3.1		
Chattanooga	762	106	112	29.39	30.30	+ .10	60.6	+ 0.1	83	2	72	38	16	49	35	52	47	72	0.66	— 2.0	2	3,746	se.	31	sw.	12	21	8	2	2.4	
Knoxville	1,004	10	88	29.13	30.30	+ .08	58.4	+ 0.8	82	1	72	35	15	45	37	50	47	80	1.57	— 1.2	5	3,622	ne.	32	s.	12	23	7	1	1.8	
Memphis	397	140	154	29.75	30.17	+ .09	64.8	+ 3.2	86	1	74	44	14	55	24	56	51	68	1.57	— 1.2	4	5,668	se.	26	nw.	12	21	7	3	2.6	
Nashville	546	128	134	29.61	30.19	+ .11	60.6	+ 1.0	83	1	73	37	15	48	33	52	47	71	0.63	— 1.8	4	3,663	nw.	32	s.	12	25	5	1	2.0	
Lexington	969	75	102	.....	.....	.....	57.9	+ 2.6	79	1	69	36	18	47	30	.....	.....	.....	1.33	— 0.9	5	6,286	sw.	37	s.	12	22	7	2	2.8	
Louisville	525	114	136	29.61	30.18	+ .09	59.8	+ 2.1	83	23	72	35	18	48	34	51	46	71	0.49	— 2.3	4	4,733	s.	34	se.	12	22	7	2	2.6	
Evansville	434	72	82	.....	.....	.....	60.8	.....	83	1	72	38	18	50	33	.....	.....	.....	4.48	.....	3	4,393	s.	30	w.	13	22	5	4	2.4	
Indianapolis	822	154	164	29.27	30.15	+ .07	56.7	+ 2.3	79	1	67	33	18	47	29	49	43	67	3.52	+ 0.7	4	7,137	s.	33	sw.	31	17	7	7	4.2	
Cincinnati	628	152	157	29.49	30.17	+ .09	57.5	+ 1.1	81	23	69	34	18	46	34	49	43	68	0.59	— 1.8	6	4,368	se.	28	se.	12	19	8	4	3.3	
Columbus	824	87	100	29.38	30.17	+ .10	55.7	+ 2.0	81	23	68	31	18	44	35	47	42	70	0.33	— 2.3	6	4,888	w.	28	sw.	12	16	7	8	4.4	
Pittsburg	842	116	123	29.26	30.16	+ .08	56.7	+ 2.0	81	1	67	34	25	46	33	48	42	67	0.38	— 2.0	3	4,045	nw.	26	s.	12	19	11	1	3.5	
Parkersburg	638	77	84	29.52	30.21	+ .12	56.1	+ 1.0	81	23	69	31	26	43	40	47	42	71	0.23	— 2.9	6	3,359	s.	24	nw.	23	21	8	2	2.8	
Elkins	1,940	41	50	28.14	30.21	+ .12	50.7	.....	80	1	66	24	26	35	48	42	39	82	0.50	.....	4	2,347	w.	25	s.	12	12	16	3	4.9	
Lower Lake Region.							52.9	+ 1.6										72	1.58	— 1.6								4.9		
Buffalo	767	178	206	29.28	30.11	+ .07	52.8	+ 2.5	76	12	60	34	18	46	23	46	42	70	1.29	— 2.4	11	11,509	sw.	56	w.	5	1	19	11	6.6	
Oswego	335	76	87	29.73	30.10	+ .04	51.0	+ 1.0	73	12	59	33	18	43	30	46	41	71	3.43	+ 0.2	11	8,086	s.	32	nw.	5	9	13	9	5.5	
Rochester	523	81	90	29.54	30.11	+ .06	51.3	+ 1.7	76	1	60	32	18	42	32	45	41	74	1.41	— 1.5	10	6,423	sw.	32	sw.	19	11	13	7	4.9	0.1
Erie	713	92	102	29.35	30.13	+ .08	52.8	+ 0.6	77	1	61	35	18	45	30	47	42	74	1.69	— 2.4	9	8,634	sw.	40	s.	13	9	13	9	5.7	
Cleveland	762	190	201	29.32	30.14	+ .07	53.8	+ 1.6	76	23	62	35	21	46	29	46	40	65	0.80	— 2.1	5	11,709	se.	56	w.	17	14	8	9	4.7	
Sandusky	629	62	70	29.45	30.13	+ .06	54.8	+ 1.6	78	30	64	32	18	46	29	47	42	69	1.10	— 1.7	8	6,203	sw.	33	nw.	17	14	9	8	4.5	T.
Toledo	628	123	127	29.45	30.14	+ .09	54.1	+ 2.0	80	23	64	30	18	44	29	46	41	69	1.06	— 1.4	6	7,530	sw.	52	se.	12	19	7	5	3.6	T.
Detroit	730	160	190	29.32	30.11	+ .06	52.8	+ 1.8	78	23	62	28	18	44	28	46	41	72	1.90	— 0.6	7	9,071	sw.	56	s.	12	16	12	3	3.8	T.
Upper Lake Region.							49.8	+ 2.9										77	2.64	— 0.4								5.6		
Alpena	600	63	80	29.39	30.06	+ .03	47.7	+ 2.2	76	30	56	24	18	39	30	42	39	80	3.06	— 0.7	16	7,735	nw.	39	se.	13	6	11	14	6.6	T.
Escanaba	612	43	57	29.37	30.04	+ .03	46.6	+ 1.9	71	23	55	28	4	38	30	43	40	81	3.82	+ 0.5	10	6,680	w.	33	n.	5	7	12	12	5.9	T.
Grand Haven	632	55	92	29.40	30.08	+ .06	50.9	+ 1.3	71	1	59	30	20	43	30	47	44	77	2.33	— 0.9	10	9,288	s.	36	sw.	15	11	11	9	4.9	T.
Houghton	668	66	74	.....	.....	.....	48.0	.....	78	30	57	28	28	39	40	.....	.....	.....	2.40	.....	13	5,371	nw.	30	w.	31	10	9	12	5.9	0.6
Marquette	734	79	116	29.32	30.02	+ .02	48.8	+ 3.7	81	21	56	29	17	42	37	43	38	73	3.12	— 0.1	15	9,338	nw.	42	sw.	30	5	15	11	6.2	1.4
Port Huron	638	70	120	29.43	30.13	+ .09	51.2	+ 2.3	77	23	61	25	18	41	32	45	42	76	1.14	— 1.6	7	9,051	sw.	46	sw.	13	12	15	4	4.7	T.
Sault Ste. Marie	614	40	61	29.34	30.01	.00	45.4	+ 2.7	74	30	53	26	18	38	27	42	39	82	5.39	+ 1.9	18	6,714	nw.	42	nw.	13	5	7	19	7.2	1.8
Chicago	823	241	274	29.23	30.11	+ .07	55.4	+ 3.4	85	1	63	33	17	48.	28	49	44	72	1.29	— 1.6	7	13,430	w.	50	s.	11	18	8	5	3.6	
Milwaukee	681	124	142	29.36	30.10	+ .07	54.6	+ 5.4	83	1	63	32	17	46	30	48	45	79	0 65	— 1.7	7	7,968	w.	36	s.	30	9	8	14	5.7	
Green Bay	617	49	57	29.40	30.07	+ .03	50.0	+ 3.1	78	22	60	29	4	40	32	44	40	75	3.60	+ 1.2	8	6,264	sw.	30	nw.	1	6	16	9	6.4	T.
Duluth	702	95	115	29.26	30.03	+ .06	48.2	+ 3.3	80	21	56	28	17	41	35	42	36	71	2.01	— 0.6	10	7,244	nw.	32	sw.	31	14	13	4	4.5	T.
North Dakota.							43.9	+ 5.5										75	1.82	+ 0.5								4.1		
Moorhead	935	54	60	29.02	30.04	+ .04	48.5	+ 5.4	82	22	60	28	27	38	42	42	38	76	3 42	+ 1.5	8	7,274	nw.	34	se.	28	12	9	10	4.8	
Bismarck	1,674	16	29	28.26	30 06	+ .06	49.6	+ 5.8	82	20	62	28	10	38	44	42	37	72	1.89	+ 0.9	6	6,126	nw.	34	nw.	31	17	8	6	4.0	T.
Williston	1,875	15	31	28.03	30.03	+ .02	48.5	+ 5.3	80	22	63	20	15	34	49	41	38	78	0.14	— 0.8	3	6,092	sw.	36	nw	12	21	8	2	3.6	

TABLE I.—*Climatological data for Weather Bureau Stations, October*, 1901—Continued.

Stations.	Elevation of instruments.			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.										Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Precipitation, in inches.			Wind.								
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Mean actual, 8 a. m. + 8 p. m. ÷ 2.	Mean reduced.	Departure from normal.	Mean max. + mean min. ÷ 2.	Departure from normal.	Maximum.	Date.	Mean maximum.	Minimum.	Date.	Mean minimum.	Greatest daily range.					Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity. Miles per hour.	Maximum velocity. Direction.	Maximum velocity. Date.	Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.
Upper Mis. Valley.							56.4	+ 3.7											68											3.9	
Minneapolis	.....	99	208	.....	.....	.....	51.6	+ 3.7	82	21	61	30	16	42	36	....	....	....	....	0.94	— 0.9	10	9,073	se.	38	sw.	30	10	10	11	....	
St. Paul	837	114	124	29.14	30.07	+ .04	51.6	+ 4.5	80	21	61	30	16	43	35	45	39	69	0.91	— 1.0	9	5,727	nw.	25	nw.	15	15	9	7	4.4	
La Crosse	714	70	78	.....	.....	.....	52.6	+ 3.1	82	22	62	30	4	44	36	....	....	....	....	2.70	+ 0.5	10	5,181	s.	25	nw.	31	12	12	7	4.3	
Davenport	606	71	79	29.45	30.10	+ .04	55.6	+ 3.5	82	23	66	31	17	45	35	48	42	69	0.45	— 2.2	8	5,258	w.	24	s.	18	17	8	6	3.5	T.
Des Moines	861	84	88	29.19	30.13	+ .08	56.2	+ 4.0	83	22	68	30	4	45	39	48	44	73	2.14	— 0.9	5	5,505	sw.	33	sw.	30	13	9	9	4.5	
Dubuque	698	101	109	29.34	30.10	+ .06	54.4	+ 3.8	80	23	64	31	4	44	36	46	40	67	1.64	— 1.1	6	5,164	sw.	28	s.	18	15	8	8	4.5	
Keokuk	614	63	78	29.45	30.10	+ .04	58.2	+ 4.1	85	1	68	35	17	48	37	49	43	68	0.93	— 1.8	7	5,141	sw.	25	sw.	1	18	7	6	3.5	
Cairo	356	87	93	29.79	30.18	+ .11	61.4	+ 2.7	84	1	72	42	18	51	33	53	49	74	3.40	+ 0.6	8	4,634	s.	36	nw.	12	17	12	2	3.0	
Springfield, Ill.	644	82	93	29.44	30.14	+ .07	57.9	+ 2.9	88	1	69	35	4	47	35	48	42	64	1.78	— 0.9	7	6,312	sw.	29	sw.	18	15	7	9	4.1	
Hannibal	534	75	110	.....	.....	.....	58.7	+ 3.7	87	1	70	30	5	47	44	....	....	....	....	0.86	— 1.8	8	6,228	sw.	30	s.	29	14	12	5	3.9	
St. Louis	567	111	210	29.53	30.14	+ .08	61.8	+ 4.3	89	1	72	42	4	52	31	52	46	64	2.12	— 0.8	8	5,917	s.	27	w.	13	21	3	7	3.0	
Missouri Valley.							57.1	+ 4.6											68											4.2	
Columbia	784	4	84	.....	.....	.....	60.2	+ 2.6	89	1	73	31	4	47	41	....	....	....	....	1.97	+ 0.2											
Kansas City	963	78	95	29.11	30.13	+ .08	61.8	+ 6.1	87	1	72	36	14	52	31	52	46	64	1.16	— 0.2	8	5,397	s.	25	nw.	3	15	8	8	4.7	
Springfield, Mo	1,324	100	103	28.74	30.13	+ .07	61.9	+ 5.9	85	1	72	34	14	52	30	52	47	65	2.20	— 1.2	5	5,646	s.	29	sw.	18	14	10	7	3.9	
Topeka	.....	81	....	.....	.....	.....	60.8	+ 4.8	84	21	71	34	14	50	34	....	....	....	....	2.26	— 0.6	7	6,874	se.	26	nw.	13	20	6	5	3.6	
Lincoln	1,189	75	84	28.81	30.08	+ .03	57.2	+ 3.1	83	18	69	33	16	46	38	49	45	72	2.83	+ 1.0	7	.....	s.	....	.....	...	10	15	6	4.5	
Omaha	1,105	115	121	28.90	30.08	+ .04	57.8	+ 4.9	83	18	68	36	14	48	38	50	45	70	3.62	+ 1.8	10	7,410	se.	36	se.	28	14	12	5	4.2	
Valentine	2,598	39	40	27.33	30.06	+ .02	52.4	+ 3.2	80	21	66	29	31	39	43	43	38	69	1.96	— 0.5	8	5,589	sw.	27	n.	15	14	8	9	4.7	
Sioux City	1,135	96	164	.....	.....	.....	54.6	+ 3.6	82	22	65	31	4	44	37	....	....	....	....	1.79	+ 0.9	7	6,444	nw.	38	s.	28	17	7	7	3.6	0.8
Pierre	1,572	43	50	28.38	30.05	+ .02	54.5	+ 5.1	84	20	67	32	3	42	45	44	37	62	2.23	+ 0.5	7	8,696	se.	42	s.	29	16	6	9	4.2	
Huron	1,306	56	67	28.66	30.07	+ .04	51.5	+ 5.0	81	22	65	29	4	38	43	43	39	74	1.77	+ 1.1	7	5,071	se.	37	n.	12	16	4	11	4.2	
Yankton	1,233	52	58	.....	.....	.....	55.5	+ 5.8	84	22	67	34	14	44	40	....	....	....	....	1.11	— 0.2	5	7,776	se.	36	se.	28	14	9	8	4.5	
Northern Slope.							55.9	+ 4.8											67											4.2	
Havre	2,503	46	47	27.37	30.02	.00	50.5	+ 6.5	77	5	63	25	31	36	44	43	38	70	0.78	— 0.7	6	6,261	nw.	44	se.	28	17	8	6	4.2	
Miles City	2,371	42	50	27.51	30.01	— .03	52.2	+ 6.1	76	•	67	26	13	38	44	46	44	83	0.16	— 0.5	2	6,329	sw.	50	sw.	29	21	9	1	3.4	
Helena	4,110	88	93	25.87	30.06	.00	50.8	+ 5.6	72	17	62	31	15	40	35	41	33	57	0.08	— 0.8	2	3,858	nw.	36	nw.	11	21	10	0	3.1	
Kalispell	2,965	45	51	26.99	30.09	+ .04	47.8	.....	74	3	60	29	13	35	35	41	37	72	0.07	— 0.8	2	5,286	sw.	40	sw.	30	15	9	7	3.9	
Rapid City	3,234	46	50	26.67	30.01	— .02	52.5	+ 3.5	80	20	65	30	31	40	38	43	36	60	0.43	.....	5	3,564	w.	23	sw.	28	21	5	5	2.8	
Cheyenne	6,088	56	64	24.10	30.12	+ .07	48.0	+ 3.1	72	17	62	28	20	34	39	37	28	55	1.16	+ 0.5	6	5,903	nw.	36	sw.	29	21	5	5	2.9	T.
Lander	5,372	26	36	24.74	30.13	+ .06	47.7	+ 4.2	75	1	63	24	13	32	43	39	33	67	0.31	— 0.4	3	7,183	nw.	41	nw.	11	17	11	3	3.3	0.8
North Platte	2,821	43	52	27.17	30.11	+ .07	54.3	+ 4.5	81	29	68	31	16	41	44	46	41	72	0.43	— 0.5	3	2,368	sw.	34	nw.	11	13	14	4	4.1	T.
Middle Slope.							59.3	+ 4.0											65											3.8	
Denver	5,291	79	151	24.82	30.11	+ .07	53.8	+ 3.3	81	1	68	31	13	39	39	41	31	52	0.41	— 0.6	4	5,799	se.	42	nw.	12	16	12	3	4.0	
Pueblo	4,685	80	86	25.38	30.08	+ .07	53.8	+ 1.6	84	1	70	28	14	38	48	42	32	53	1.52	+ 0.2											
Concordia	1,398	42	47	28.62	30.10	+ .06	59.8	+ 5.3	85	18	72	32	16	48	40	51	47	74	0.46	— 0.4	5	5,366	sw.	43	e.	10	18	10	3	3.3	2.0
Dodge	2,509	44	52	27.48	30.08	+ .07	59.8	+ 4.7	88	1	72	33	13	47	44	50	46	75	0.51	— 0.2	3	4,230	nw.	31	ne.	11	15	15	1	3.9	
Wichita	1,358	78	85	28.68	30.11	+ .07	62.3	+ 4.7	88	1	73	34	14	52	32	53	48	69	1.30	— 0.2	3	5,942	s.	32	s.	28	12	14	5	4.1	
Oklahoma	1,214	54	62	28.82	30.10	+ .07	66.2	+ 4.2	92	1	78	35	14	55	38	56	50	66	1.64	+ 0.4	8	7,638	se.	48	se.	27	19	9	3	3.5	T.
Southern Slope.							64.4	+ 4.0											66											4.2	
Abilene	1,738	45	54	28.27	30.07	+ .02	69.3	+ 4.8	92	4	80	45	13	59	28	58	52	64	1.34	— 0.4	8	6,812	s.	30	s.	28	13	12	6	4.3	
Amarillo	3,676	54	61	26.34	30.07	+ .04	59.4	+ 3.2	80	1	70	38	13	49	36	50	45	69	1.93	+ 0.1											
Southern Plateau.							62.4	+ 2.0											64											3.8	
El Paso	3,762	10	110	26.22	30.01	+ .04	64.8	+ 1.8	90	2	78	41	14	52	41	52	44	60	0.61	— 1.7	5	6,414	se.	30	se.	28	15	8	8	4.2	
Santa Fe	7,013	47	50	23.36	30.07	+ .06	52.2	+ 2.4	74	2	63	32	13	42	29	41	32	54	1.19	+ 0.5										2.8	
Flagstaff	6,907	12	25	23.40	30.13	.....	48.4	— 0.1	76	2	63	25	11	33	48	40	....	....	1.46	+ 0.5											
Phoenix	1,108	47	57	28.74	29.89	.00	73.2	+ 3.4	100	1	88	41	30	58	41	55	41	39	2.98	+ 2.1	11	6,359	ne.	48	nw.	30	18	5	8	3.7	
Yuma	141	16	50	29.71	29.86	— .02	74.4	+ 1.6	99	14	90	47	30	59	42	58	46	43	1.15	+ 0.2	6	4,332	se.	27	se.	29	23	6	2	2.5	
Independence	3,910	51	58	26.02	29.94	— .02	61.4	+ 2.7	81	12	73	40	29	50	30	47	30	36	1.94	+ 2.1	8	4,639	se.	48	se.	27	19	9	3	3.5	T.
Middle Plateau.							54.3	+ 3.6											54											2.8	
Carson City	4,720	82	92	25.34	30.08	+ .08	52.8	+ 3.2	80	14	68	28	31	37	44	44	38	64	0.84	— 0.1										4.1	
Winnemucca	4,344	59	70	25.69	30.04	— .01	51.9	+ 3.7	79	17	66	28	14	37	49	44	35	58	0.65	+ 0.4	4	5,661	nw.	54	w.	28	20	11	0	2.3	
Modena	5,479	10	38	24-68	30.12	.....	52.0	.....	78	2	67	29	14	37	49	40	28	47	0.73	+ 0.3	6	3,514	sw.	38	sw.	2	15	7	9	4.1	0.4
Salt Lake City	4,366	105	110	25.70	30.08	+ .01	55.6	+ 3.3	85	2	66	36	31	46	33	45	35	50	0.98	— 0.6	5	3,783	se.	36	nw.	3	22	4	5	3.3	
Grand Junction	4,608	43	51	25.45	30.08	+ .05	56.8	+ 4.3	85	3	70	34	30	43	39	44	34	51	0.35	— 0.8	3	2,860	se.	28	sw.	27	13	11	7	4.0	
Northern Plateau.							55.6	+ 5.6											62											3.9	
Baker City	3,471	53	58	26.52	30.09	+ .01	53.0	+ 4.9	76	1	66	25	31	40	36	43	34	56	0.65	— 0.6											
Boise	2,739	61	68	27.24	30.08	.00	56.8	+ 7.4	85	2	70	38	30	44	37	47	40	61	0.35	— 0.8	4	4,072	s.	20	sw.	29	15	5	11	4.5	
Lewiston	757	52	61	.....	.....	.....	57.6	+ 4.8	80	3	71	39	13	44	39	....	....	....	1.70	+ 0.7	5	2,246	nw.	19	se.	26	19	4	8	3.8	
Pocatello	4,482	46	54	25.57	30.09	+ .01	52.9	+ 4.9	82	2	66	32	19	40	44	43	36	58	0.34	.....	4	1,479	se.	29	nw.	29	16	8	7	3.6	
Spokane	1,943	99	107	28.04	30.08	+ .02	53.9	+ 5.9	78	2	67	34	17	41	37	47	40	64	0.58	— 0.5	6	5,401	se.	35	sw.	3	15	10	6	4.3	
Walla Walla	1,000	65	73	28.99	30.05	— .03	59.4	+ 5.4	78	18	71	43	1	48	29	53	49	72	0.25	— 1.3	4	2,734	ne.	29	sw.	29	14	8	9	4.2	
N. Pac. Coast Reg.							56.5	+ 5.0											64											2.9	
Neah Bay	50	7	50	29.98	30.03	— .01	53.4	+ 3.0	68	2	57	43	29	50	16	52	51	93	0.38	— 1.2	5	3,096	s.	27	sw.	29	23	5	3	3.9	
Port Crescent	259	14	20	.....	.....	.....	52.2	+ 4.6	75	2	60	37	12	44	36	....	....	....	3.05	— 1.8										6.1	
Seattle	123	114	121	29.94	30.07	+ .01	57.2	+ 5.6	79	22	64	45	2	50	29	53	51	82	8.29	— 2.1	18	6,187	e.	42	w.	29	9	4	18	7.0	
Tacoma	213	113	120	.....	.....	.....	56.0	+ 5.4	75	22	64	40	13	48	30	....	....	....	1.86	— 1.8	11	2,212	e.	28	sw.	29	8	11	12	5.9	
Astoria	20	57	64	.....	.....	.....	59.1	+ 4.9	74	13	63	46	6	52	32	....	....	....	1.44	— 1.5	6	3,330	se.	23	se.	31	10	9	12	5.9	
Portland, Oreg	154	203	213	29.90	30.06	— .02	59.1	+ 5.7	78	22	67	44	8	51	30	55	52	81	2.60	— 1.4	8	3,256	sw.	26	sw.	31	3	12	16	6.9	
Roseburg	518	56	67	29.51	30.07	— .03	58.8	+ 6.1	80	14	68	42	30	50	37	54	51	79	4.38	— 1.7	15	.....	s.	....	.....	...	10	4	17	6.1	
Mid. Pac. C'st Reg.							61.9	+ 3.5											67											4.2	
Eureka	62	60	69	30.00	30.06	+ .01	55.8	+ 2.6	76	12	61	46	30	51	22	53	51	86	0.75	— 3.3	7	5,232	nw.	36	s.	29	10	7	14	5.8	
Mount Tamalpais	2,375	11	18	27.57	30.02	+ .01	61.8	.....	84	22	67	42	29	56	19	51	43	60	2.00	— 0.8	7	1,692	nw.	17	sw.	28	12	7	12	5.3	
Red Bluff	332	50	56	29.64	29.99	— .01	67.8	+ 4.3	93	12	79	44	28	56	33	55	45	49	1.62	— 0.1										4.2	
Sacramento	69	106	117	29.90	29.98	— .01	66.5	+ 4.7	92	11	79	45	29	54	35	57	50	62	2.46	0.0	5	2,995	nw.	33	w.	28	9	13	9	5.5	
San Francisco	155	161	167	29.86	30.02	+ .02	61.8	+ 2.5	91	12	69	50	14	54	29	56	53	80	1.05	.....	5	12,701	nw.	65	nw.	27	21	5	5	2.9	
Point Reyes Light	.....	12	16	.....	.....	.....	57.7	+ 3.6	91	11	65	47	31	51	39	....	....	....	0.64	— 0.6	5	3,701	n.	25	n.	10	18	8	5	3.3	
S. Pac. Coast Reg.							64.6	+ 1.1											71											3.2	
Fresno	330	67	70	29.62	29.97	+ .01	67.1	+ 2.2	94	14	80	41	29	54	38	56	47	55	1.56	+ 0.7	3	4,445	se.	24	se.	26	19	8	4	3.2	
Los Angeles	338	74	82	29.61	29.96	+ .01	64.8	+ 1.1	97	21	76	46	13	54	36	57	54	80	0.64	— 0.6	5	6,139	w.	30	w.	27	15	10	6	4.2	
San Diego	87	94	102	29.85	29.95	— .01	62.8	— 0.4	96	21	68	51	30	57	35	58	55	79	0.89	— 1.4	7	13,735	nw.	....	.....	...	8	7	16	5.9	
San Luis Obispo	201	10	46	29.80	30.02	+ .05	63.5	+ 1.5	97	13	77	44	28	50	50	54	49	71	1.32	+ 0.6										3.2	
West Indies.																															
Basseterre	29	41	54	29.85	29.88	.....	80.6	.....	88	17	86	68	21	75	18	76	74	80	0.56	0.0	5	3,148	nw.	17	n.	28	17	10	4	3.8	
Bridgetown	30	57	65	29.85	29.88	.....	80.6	.....	90	6	87	72	4	74	16	76	74	79	1.88	+ 1.1	2	2,954	w.	18	w.	28	13	15	3	3.6	
Cienfuegos	52	62	67	29.86	29.91	.....	79.0	.....	92	13	86	69	21	72	19	73	72	88	0.28	— 0.1	3	3,853	nw.	22	ne.	21	22	6	3	3.2	
Grand Turk	11	6	20	.....	.....	.....	81.1	.....	92	6	88	68	2	74	23	....	....	....	2.58	+ 1.5	4	3,310	n.	22	w.	3	21	8	2	2.9	
Havana	57	87	105	29.88	29.94	.....	78.6	.....	88	12	83	70	26	74	15	75	74	86	7.78	.....	19	4,636	ne.	34	sw.	31	11	12	8	5.0	
Kingston	286	88	92	29.56	29.86	.....	78.9	.....	88	28	86	69	10	71	18	73	72	84	9.36	+ 1.8	19	4,592	se.	24	s.	1	12	7	12	5.6	
Port of Spain	40	65	66	29.83	29.87	.....	81.2	.....	92	2	88	71	5	74	19	75	73	79	4.86	.....	18	.....	ne.	....	.....	...	0	8	23	7.5	
Puerto Principe	352	55	62	29.56	29.90	.....	78.1	.....	89	1	86	68	11	70	20	73	73	91	9.83	.....	19	3,453	ne.	19	w.	31	5	18	8	5.6	
Roseau	25	37	47	29.85	29.87	.....	81.5	.....	90	25	88	74	18	75	16	74	72	74	6.40	.....	17	2,959	e.	17	e.	29	5	12	14	6.6	
San Juan	82	48	90	29.79	29.87	.....	80.4	.....	88	16	86	71	3	74	17	75	73	83	7.23	.....	21	4,657	ne.	27	e.	11	9	16	6	5.1	
Santiago de Cuba	82	46	52	29.79	29.87	.....	79.4	.....	90	28	87	69	11	72	18	74	72	86	3.90	.....	17	3,980	ne.	25	s.	2	11	11	9	5.3	
Santo Domingo	57	37	44	.....	.....	.....	.....	.....	...	...	...	...	...	...	...	...	...	...	8.30	+ 2.1	21	4,493	s.	37	se.	28	5	11	15	6.6	
Willemstad	75	39	46	29.76	29.83	.....	82.4	.....	90	16	87	70	4	78	15	77	75	79	12.78	.....	18	4,616	n.	36	ne.	13	5	20	6	5.7	
																			3.98	.....	13	4,805	e.	27	sw.	4	4	21	6	5.5	

TABLE II.—*Climatological record of voluntary and other cooperating observers, October*, 1901.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Alabama.	°	°	°	*Ins.*	*Ins.*
Ashville	80	31	58.8	0.56	
Bermuda	86	35	65.1	1.19	
Birmingham	84	37	64.2	0.23	
Bridgeport				0.23	
Burkville				2.20	
Calera				0.42	
Camp Hill	87	37	63.4	3.35	
Citronelle	87	43	68.5	2.88	
Clanton	82	37	61.1	0.79	
Cordova	85	34	61.0	0.50	
Daphne [c]	90	43	68.0	0.63	
Decatur	82	35	59.0	1.15	
Demopolis				0.35	
Eufaula [a]	83	38	63.1	1.91	
Eutaw	85	39	65.0	1.55	
Evergreen	92	40	63.6	0.99	
Flomaton	85	38	64.4	1.48	
Florence [a]				0.93	
Florence [b]	88	36	62.4	0.94	
Fort Deposit	84	41	64.0	1.90	
Gadsden	86	35	62.8	1.13	
Goodwater	83	36	61.8	1.28	
Greensboro	84	41	64.8	0.25	
Greenville				0.90	
Hamilton	85	34	60.5	1.23	
Healing Springs				1.40	
Helena				1.50	
Highland Home	83	42	65.4	0.43	
Letohatchee				1.50	
Livingston [a]	89	36	61.6	0.42	
Lock No. 4	83	36	61.3	2.50	
Madison	89	35	62.4	0.79	
Maplegrove	85	32	58.6	1.10	
Marion	88	41	66.7	0.90	
Mount Willing	87			0.56	
Newbern	82	39	63.8	0.55	
Notasulga				1.18	
Oneonto	80	32	59.4	0.70	
Opelika	80	41	62.9	0.50	
Oxanna	81	35	61.0	0.70	
Prattville [c]	85	35	62.2		
Pushmataha	82	36	62.2	0.69	
Riverton	87	35	59.9	1.17	
Scottsboro	81	34	58.4	0.63	
Selma	87	39	64.5	0.21	
Talladega	85	33	62.1	1.64	
Tallassee				0.82	
Thomasville	85	40	65.4	1.75	
Tuscaloosa	84	37	61.9	1.35	
Tuscumbia	84	38	60.1	1.18	
Tuskegee	87	40	66.1	1.29	
Union Springs	82	40	63.1	1.30	
Uniontown	85	39	64.6	0.57	
Valleyhead	84	31	59.6	0.58	
Verbena				0.63	
Wetumpka	89	37	64.9	0.97	
Alaska.					
Killisnoo	54	32	43.6	9.10	
Sitka	61	32	45.0	15.59	
Skagway	70	18	41.8		
Arizona.					
Allaire Ranch				0.87	
Arizona Canal Co. Dam	98	46	72.8	0.55	
Aztec [*1]	97	48	78.2	0.00	
Benson [*1]	90	45	67.6	1.00	
Bisbee	84	33	62.4	2.56	
Bowie [*1]	86	60	69.4	1.20	
Buckeye	98	38	69.0	0.30	
Casagrande [*1]	95	60	75.3	0.45	
Champie Camp	102	35	72.0	0.80	
Cochise [*5]	77	50	65.0	1.06	
Congress	90	42	71.9	0.30	
Dragoon [*1]	85	47	69.0	2.05	
Dudleyville	100	41	67.1	1.93	
Fort Apache	87	20	55.8	1.22	
Fort Defiance	78	25	49.2	0.65	
Fort Grant	96	34	65.9	1.64	
Fort Huachuca	99	34	63.4	1.80	
Fort Mohave	99	41	72.8	0.03	
Gilabend [*1]	106	52	75.8	0.40	
Globe	94	40	65.6	1.23	
Ingleside	96	48	73.0	0.94	
Jerome	86	32	63.8	2.30	T.
Kingman	90	36	66.9	0.10	
Maricopa [*1]	95	55	76.8	0.40	
Mesa	98	41	70.4	0.50	
Mohawk Summit [*1]	107	58	79.6	0.10	
Mount Huachuca	87	36	63.6	1.73	T.
Natural Bridge				1.04	
Nogales	91	36	63.8	1.70	T.
Oracle	88	40	64.4	1.93	
Oro				1.51	
Parker	103	38	74.2	T.	
Phoenix	100	40	70.7	0.55	
Pima	95	37	65.2	1.94	
Pinal Ranch				1.50	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Arizona—Cont'd.	°	°	°	*Ins.*	*Ins.*
Prescott	83	24	53.3	0.73	2.0
St. Johns	90	30	54.8	0.77	
San Carlos	95	38	64.8	0.95	
Sentinel [*1]	101	61	79.6	T.	
Showlow				1.50	
Signal [j]	101	32	71.0	T.	
Silverking				1.10	
Strawberry	84	28	53.7	0.88	3.0
Superstition				1.41	
Taylor	88	26	53.2	0.26	
Tombstone	91	34	64.6	1.51	
Tonto	97	35	66.2	0.47	
Truxton [b]	89	39	64.2	T.	
Tuba	85	39	58.2	0.30	
Tucson	98	46	69.4	1.18	
Vail [*5]	91	48	71.7	0.15	
Walnut Grove				1.00	
Willcox [*1]	84	43	59.8	0.66	
Yarnell				0.67	
Arkansas.					
Amity	89	35	63.0	1.74	
Arkadelphia	90	38	66.8	2.20	
Arkansas City				0.96	
Batesville	94	34	63.8	1.20	
Beebranch	90	33	64.2	1.55	
Blanchard	85	36	63.0	2.08	
Brinkley	88	37	62.0	4.16	
Camden [a]				3.05	
Camden [b]	87	40	64.7	3.39	
Conway	92	35	65.0	2.22	
Corning	91	32	60.0	1.24	
Dallas	55	36	64.8	0.98	
Dardanelle				2.07	
Elon	91	35	63.8	1.74	
Fayetteville	89	31	62.9	2.64	
Fulton				2.16	
Hardy		41		0.53	
Helena [a]				1.80	
Helena [b]	85	39	63.3	1.88	
Hot Springs [b]				1.63	
Jonesboro	91	42	65.6	1.06	
Keesees Ferry	86	32	62.4	0.68	
Lacrosse	87	34	63.2	1.25	
Lonoke	90	35	63.1	1.65	
Lutherville	87	35	63.4	3.06	
Malvern	94	35	64.0	1.75	
Marianna	84	37	61.5	3.20	
Marvell	87	38	64.1	3.10	
Mossville	87°	31°	62.8°	1.59	
Mount Nebo	84	39	63.9	2.20	
New Gascony	90	37	64.2	3.18	
Newport [a]				1.74	
Newport [b]	90	34	62.2	1.38	
Newport [c]	88	34	61.6	1.81	
Oregon	95	38	62.7	0.65	
Osceola	88	34	62.2	2.73	
Ozark	93	37	67.0	2.09	
Pinebluff	89	36	63.4	2.56	
Pocahontas	88	31	61.0	1.09	
Pond	88	27	61.9	1.99	
Prescott	90	37	66.0	2.33	
Rison	95	34	65.8	2.20	
Rosadale	90	35	66.4	1.96	
Russellville	89	36	63.8	2.18	
Silversprings	89	32	62.8	2.00	
Spielerville	92	39	65.2	3.13	
Stuttgart	88	36	63.6	4.21	
Texarkana	93	37	67.8	1.75	
Warren	89	38	64.2	5.03	
Washington	89	37	65.2	2.54	
Wiggs	86	30	63.4	2.18	
Winchester	90	36	63.4	3.30	
Winslow	84	31°	62.0	3.02	
Witts Springs	91	31	62.7	1.58	
California.					
Angiola	96	34	64.4	0.35	
Bakersfield	97	38	65.8	0.13	
Ballast Point L. H.				0.25	
Bear Valley				4.45	5.0
Berkeley	89	48	62.4	0.68	
Bishop	87	33	59.2	0.81	
Boca [*1]	76	36	57.1	0.80	2.0
Bodie	68	10	40.7	1.60	10.0
Bowman	76	32	54.3	4.28	10.0
Branscomb				3.19	
Caliente [*1]	87	40	58.6	0.00	
Campbell	92	39	62.0	0.56	
Cape Mendocino L. H.				1.86	
Cedarville	80	29	52.1	1.22	
Chico [*1]	93	48	65.2	1.07	
Cisco [*1]	61	30	41.8	3.27	24.0
Claremont	91	40	62.8	2.44	
Corning [*1]	90	50	65.8	1.42	
Crescent City	84	40	55.4	3.56	
Crescent City L. H.				3.82	
Cuyamaca	72	27	50.6	1.94	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Delano [*1]	93	56	72.2	0.41	
Delta [*1]	88	44	64.5	2.95	
Dunnigan [*1]	97	45	67.3	1.17	
Durham [*5]	94	43	66.4	1.44	
East Brother L. H.				0.75	
Edmanton [*1]	78	32	52.4	4.27	2.0
Elcajon	99	40	65.1	0.32	
Elmdale	96	40	65.9	0.60	
Elsinore	102	39	67.4	1.08	
Escondido	99	37	64.4	0.62	
Fallbrook	93	42	62.4	0.87	
Folsom City [*1]	91	45	65.2	3.33	
Fordyce Dam				4.95	16.0
Fort Ross	87	46	60.4	1.90	
Georgetown	84	34	62.0	3.32	
Gilroy (near)	103	38	65.4	0.89	
Grass Valley				4.45	
Greenville	82	28	53.0	3.07	0.5
Hanford	94	28	61.8	T.	
Healdsburg	102	37	63.1	0.97	
Hollister	98	39	63.6	0.58	
Humboldt L. H.				2.56	
Idylwild				1.03	
Indio [*1]	99	52	77.7	0.00	
Iowa Hill [*1]	83	41	61.2	3.98	
Irvine	100	50	70.6	1.06	
Jackson	80	35	60.0	2.62	
Kennedy Gold Mine	84	36	61.2	3.36	
Kernville				0.72	
King City	96	42	58.0	0.66	
Kono Tayee	83	42	64.3	1.04	
Laguna Valley				1.42	T.
Lamesa				0.45	
Laporte [*1]	72	33	49.6	4.82	6.0
Legrand				0.71	
Lemoncove	98	40	68.8	0.71	
Lick Observatory	90	28	56.5	2.19	
Lime Point L. H.				0.83	
Lodi	90	44	65.4	0.85	
Los Gatos [b]	89	41	63.5	1.10	
Mammoth [*1]	95	55	77.3	0.00	
Manzana	92	36	64.2	2.02	
Mare Island L. H.				1.29	
Merced [b]	97	39	67.2	0.25	
Mills College				0.73	
Milo				1.80	
Milton (near)	90	40	67.2	1.37	
Modesto [*1]	103	49	70.3	0.72	
Mohave [*1]	85	40	63.7	0.52	
Mokelumne Hill [*3]		41	60.6	2.04	
Monterio	86	36	64.5	1.86	
Monterey [*5]	86	42	59.9	0.98	
Mount St. Helena				2.60	
Napa	100	44	66.0	1.32	
Needles	92	50	74.8	0.00	
Nevada City	79	30	56 5	4.16	
Newhall [*5]	98	45	71.4	2.32	
Niles	92	40	63.0	0.89	
North Bloomfield	88	32	59.4	3.98	
North Ontario	89	44	65.0	2.59	
North San Juan [*1]	93	34	59.4	4.38	
Oakland	90	47	62.0	0.64	
Oleta [*1]	84	39	58.7	2.85	
Orland [*1]	98	46	68.6	1.42	
Palermo	97	42	66.0	2.24	
Palomar Mountain				2.55	
Paso Robles	96	36	63.0	1.57	
Peachland [*5]	92	42	63.2	1.58	
Piedras Blancas L. H.				1.45	
Pigeon Point L. H.				0.40	
Pilot Creek				5.06	T.
Pine Crest	96	47	66.6	3.55	
Placerville	82	34	57.8	2.12	
Point Ano Nuevo L. H.				0.73	
Point Arena L. H.				1.25	
Point Bonita L. H.				1.46	
Point Conception L. H.				2.35	
Point Fermin L. H.				0.80	
Point Hueneme L. H.				1.55	
Point Lobos	86	49	59.0	0.52	
Point Loma L. H.				0.18	
Point Montara L. H.				0.30	
Point Pinos L. H.				0.72	
Point Sur L. H.				0.64	
Pomona (near)	96	43	66.0	2.29	
Poway				0.24	
Quincy	76	32	51.6	3.59	T.
Ranch House				1.46	
Redding	91	45	66.6	3.08	
Redlands	97	43	67.7	0.92	
Reedley	96	40	68.2	0.85	
Represa	86	42	64.4	3.02	
Riovista				1.82	
Riverside	97	41	65.0	0.80	
Roe Island L. H.				0.43	
Rohnerville				2.21	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Rosewood	93	37	64.4	0.97	
Sacramento	87	42	62.8	1.90	
Salinas *1	79	50	60.8	0.50	
Salton	112	52	83.0	0.00	
San Bernardino	101	38	66.2	1.09	
San Jacinto	95	39	65.1	0.61	
San Jose	93	41	64.7	1.00	
San Leandro	91	41	62.2	0.60	
San Luis L. H				1.55	
San Mateo *5	90	48	64.6	1.25	
San Miguel *1	98	39	56.6	0.88	
Santa Barbara	96	50	63.6	2.42	
Santa Barbara L. H				2.00	
Santa Clara				0.69	
Santa Cruz	95	37	60.2	0.88	
Santa Cruz L. H				0.90	
Santa Maria	99	42	62.4	1.60	
Santa Monica				2.71	
Santa Paula	96	46	65.8	2.24	
Santa Rosa *1	94	48	62.0	1.16	
Shasta	93	41	68.8	2.06	
Sierra Madre	90	45	65.8	3.63	
Sonoma				1.12	
S. E Farallone L. H				1.40	
Stockton	88	45	63.8	0.80	
Storey	95	42	63.9	0.42	
Summerdale	78	24	53.4	4.67	3.0
Susanville	75	35	54.9	2.28	T.
Tehama *1	90	50	72.1	1.04	
Tejon Ranch	92	45	68.8	0.40	
Trinidad L. H				2.13	
Truckee *1	64	24	40.7	2.78	
Tulare *b*				0.39	
Tulare *c*	100	38	67.4	0.39	
Ukiah	96	36	62.0	1.61	
Upperlake	94	34	63.2	1.09	
Vacaville *1	96	47	67.1	0.72	
Ventura	98	49	63.5	2.91	
Visalia	97	37	67.3	0.40	
Volcano Springs *1	104	51	78.2	T.	
Wasco	98	39	66.8	0.32	
West Saticoy				1.85	
Wheatland	93	43	64.6	1.96	
Williams *5	95	52	70.2	0.17	
Wilmington *1	98	50	63.0	0.93	
Wire Bridge *5	88	42	64.4	5.06	
Yerba Buena L. H				0.85	
Yreka	76	32	55.2	1.28	
Zenia				3.56	
Colorado.					
Alford	74	22	48.8	0.25	3.0
Arkins				0.28	T.
Ashcroft				1.41	T.
Bailey	74	14	44.0	0.58	5.5
Blaine	85	30	57.0	0.51	
Boulder	80	31	53.6	0.65	4.0
Boxelder				0.46	
Breckenridge	65	5	35.9	0.78	9.8
Buenavista				0.03	
Canyon	83	24	54.7	0.31	
Castlerock	78	25	52.2	0.28	2.5
Cedaredge	82	29	52.6	0.74	
Cheyenne Wells	83[d]	26[d]	53.8[d]	0.49	T.
Collbran	82	27	51.0	0.94	
Colorado Springs	79	25	51.0	0.49	
Delta	87	27	53.3	0.56	
Durango	82	28	51.7	1.24	
Fox				0.50	
Gilman				0.67	2.8
Gleneyrie	76	26	50.0	0.61	
Greeley	81	24	51.8	0.75	T.
Grover				0.10	
Gunnison	76	11	44.2	0.64	
Hamps	79	24	49.6	0.81	T.
Hoehne	84	23	55.0	0.46	
Holly	87	29	58.0	0.32	
Hugo				0.00	
Husted	80	22	48.0	0.85	3.0
Lake Moraine	60	15	39.5	1.03	7.0
Lamar	89	30	57.8	0.53	
Laporte				0.05	
Las Animas	85	25	55.0	0.00	
Lay	80	13	45.0	0.29	
Leadville (near)				0.22	4.2
Leroy	78	25	52.2	0.47	
Longs Peak	67	21	41.4	0.95	2.5
Marshall Pass				0.78	11.0
Meeker	80	18	47.7	0.53	
Mitchell				0.30	4.5
Montrose				0.73	
Moraine	71	17	44.3	0.38	T.
Pagoda	83	18	47.3	0.77	
Perrypark				0.70	5.0
Rockyford	84	28	55.4	0.25	
Rogers Mesa	86	27	53.0	0.67	
Ruby				1.81	25.0
Russell	72	18	42.6	1.35	0.5
Saguache	83	20	50.2	0.46	
Salida	84	18	49.0	0.32	
San Luis	75	20	47.0	1.25	
Santa Clara	73	20	48.6	0.48	0.5
Sapinero				0.41	
Seibert				0.59	T.
Silt	83	26	52.6	1.05	
Sugarloaf	70	20	46.2	0.66	2.0
Telluride	73[f]	22[f]	48.8[f]	0.77	6.2
Trinidad	80	25	55.0	0.60	
T. S. Ranch				1.42	
Twinlakes				0.29	1.0
Vilas				0.32	
Wagon Wheel	70	14	40.4	0.97	1.2
Walden	64[e]	15[e]	38.0[e]	0.04	0.2
Wallet				0.45	T.
Westcliffe	73	16	45.0	0.49	0.5
Whitepine				1.09	6.0
Wray	83	25	53.9	0.43	
Yuma				0.39	T.
Connecticut.					
Bridgeport	76	28	53.4	4.37	
Canton	73	24	49.7	4.66	
Colchester	73	27	52.0	2.82	
Falls Village				3.97	
Hartford *b*	73	32	52.4	3.50	
Hawleyville	75	23	51.6	4.14	
Lake Konomoc				2.41	
Middletown	77	25	52 7	4.79	T.
New London	75	32	53.6	1.60	
North Grosvenor Dale	80	25	50.7	3.36	
Norwalk	74	24	51.0	3.48	
Southington	75	25	51.4	3.55	
South Manchester				3.40	
Storrs		30		1.97	
Voluntown	79[g]	23[g]	50.4[g]	1.85	
Wallingford				3.84	
Waterbury	77	24	52.2	4.32	
West Cornwall	74	29	50.9	4.37	T.
West Simsbury				4.27	
Delaware.					
Milford	82	31	57.6	2.27	
Millsboro	81	29	55.8	0.93	
Newark	78	30	53.2	0.98	
Seaford	79	34	56.4	2.18	
District of Columbia.					
Distributing Reservoir *5	79	40	57.6	0.84	
Receiving Reservoir *5	77	35	55.9	0.69	
West Washington	83	29	55.6	1.20	
Florida.					
Archer	88	46	70.0	1.28	
Bartow	90	53	75.4	0.36	
Bonifay	90	44	67.2	4.50	
Brooksville	87	56	71.6	0.30	
Carrabelle	82	46	68.6	0.75	
Clermont	92	58	76.4	0.40	
De Funiak Springs	88	40	66.8	2.11	
Deland	87	49	71.2		
Earnestville	91	56	73.3	0.55	
Eustis	92	56	74.8	1.01	
Federal Point	85	51	70.5	3.54	
Flamingo	91[d]	68[d]	80.0[d]	2.74	
Fort Meade	94	48	75.2	1.15	
Fort Pierce	90	60	75.2	2.18	
Gainesville	86	51	70.8	3.30	
Huntington	92	49	72.4	1.27	
Hypoluxo	91	64	79.2	7.00	
Inverness	88	49	71.2	2.31	
Jasper	88[d]	47[d]	66.7[d]	2.30	
Kissimmee	89	54	73.2	1.18	
Lake Butler	92	46	69.4	2.15	
Lake City	91	45	69.9	3.90	
Macclenny	90	44	69.6	1.75	
Manatee	91	52	75.0	0.59	
Marco	92	65	77.7	0.10	
Marianna	86	45	65.0	1.30	
Merritt Island	86	63	76.9	0.82	
Miami	90	67	78.4	4.92	
Micanopy	89	42	70.4	0.80	
Middleburg	88	43	68.4	1.81	
Myers	88	63	75.3	0.78	
New Smyrna	90	53	72.2	2.40	
Nocatee	94	55	75.8	0.26	
Ocala	93	50	71.9	0.41	
Orange City	89	49	72.8	2.13	
Orlando	88	57	73.6	2.20	
Rockwell	93	49	73.2	2.05	
St. Andrews	87	44	70.4	1.75	
St. Augustine	86	67	74.3	2 50	
Stephensville *1	91	58	73.1	0.98	
Sumner	94	42	71.1	1.73	
Switzerland	88	50	70.8	2.12	
Tallahassee	82	46	67.6	0.03	
Tarpon Springs	92	54	74.0	2.86	
Waukeenah	86	43	68.0	T.	
Wausau	86	39	65.0	3.42	
Wewahitchka	90	44	66.4	1.28	
Georgia.					
Adairsville	83[d]	36[e]	59.6[e]	0.56	
Albany	84[i]	42	65.2[e]	2.78	
Allapaha	88	42	65.5	0.23	
Allentown	89	37	64.2	0.97	
Alpharetta	84	34	60.4	1.04	
Americus	83[d]	42	63.0	0.86	
Athens *b*	81[e]	38	59.0[d]	1.05	
Bainbridge	88	42	64.6	0.74	
Blakely	83			1.45	
Bowersville	86	38	61.1	0.90	
Brent	85	40	64.0	0.48	
Camak	86	41	61.8	1.08	
Canton				1.97	
Carlton				0.40	
Clayton	78	34	55.4	1.90	
Columbus	85	44	64.8	0.55	
Covington	84	37	62.6	0.61	
Dahlonega	81	36	59.6	0.80	
Diamond	82	34	58.0	0.93	
Dublin				0.71	
Eastman	85	43	65.4	2.70	
Elberton	80	43	63.4	0.85	
Experiment	82	39	62.6	0.51	
Fitzgerald	92	40	66.3	1.10	
Fleming		38		0.86	
Fort Gaines	82	41	63.7	1.91	
Gainesville	80	39	59.8	1.34	
Gillsville	87	35	62.0	0.62	
Griffin	82	41	63.4	0.37	
Harrison	85	39	63.8	1.32	
Hawkinsville	82	43	63.8	0.95	
Hephzibah				1.27	
Jesup	86	41	65.4	1.26	
Lost Mountain	83	38	62.7	0.69	
Louisville	81	38	62.8	1.89	
Lumpkin	85	39	65.6	1.24	
Marshallville	85	42	64.9	2.55	
Mauzy	92	40	67.5	0.07	
Milledgeville	85	38	61.7	0.46	
Millen	90	35	64.2	0.21	
Morgan	84	40	64.0	1.07	
Naylor	90	41	67.6	T.	
Newnan	79	38	60.4	1.65	
Oakdale				0.66	
Point Peter	84	34	59.6	0.54	
Poulan	87	40	64.7	1.57	
Putnam				0.73	
Quitman	86	42	65.6	0.16	
Ramsey	82	32	59.4	0.98	
Resaca				0.55	
Rome	84	35	60.2	0.44	
Statesboro	90	37	65.3	0.65	
Talbotton	85	37	62.8	0.52	
Thomasville	88	44	68.0	0.19	
Toccoa	82	38	60.6	0.95	
Union Point	81	37	60.8	0.97	
Valona	87	44	66.5	0.79	
Washington	82	42	61.8	1.97	
Waverly	90	44	68.5	1.95	
Waycross	84	41	65.2	4.08	
Waynesboro	83	39	62.6	0.92	
Westpoint	83	38	62.4	0.82	
Woodbury	86	34	61.2	0.26	
Idaho.					
Albion	85	28	52.1	2.08	
American Falls	84	25	51.2	1.01	
Atlanta	76	26	47.0	1.52	
Blackfoot	78	28	51.4	0.18	
Burnside	75	27	48.6	0.50	
Chesterfield	75	10	40.8	0.95	
Downey	82	22	49.0	0.12	
Forney	74	20	44.5	0.71	T.
Garnet	90	32	58.8	2.02	
Hailey	84	27	51.2	1.50	
Idaho City	82	31	52.3	0.70	
Lake	70	24	47.0	0.92	
Lakeview	72	32	50.5	1.20	
Lost River	76[i]	23[j]	47.9[j]	1.04	
Moscow	79	35	54.4	0.71	
Murray	73	28	48.2	1.46	
Oakley	86	29	52.6	1.50	
Ola	86	30	53.1	0.96	
Paris	87	24	49.2	0.49	
Payette	90	28	57.2	0.88	
Pollock	80	34	55.5	0.54	
Porthill	68	29	46.9	0.47	
Priest River	76	29	48.8	1.09	
St. Maries	80	28	52.9	1.11	
Vernon	80	21	48.1	0.82	
Weston	85[e]	27[e]	50.9[e]	1.28	
Illinois.					
Albion	84	35	58.4	2.87	
Aledo	82	30	55.7	0.87	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Illinois—Cont'd.	°	°	°	*Ins.*	*Ins.*
Alexander	91	25	59.0	2.00	
Antioch	84	24	53.6	0.61	
Ashton	84	24	53.4	0.73	
Astoria	86	26	55.3	0.71	
Aurora *a*	88	27	54.0	1.27	
Bloomington	91	30	57.6	2.14	
Bushnell	85	30	56.5	0.70	
Cambridge	81	31	54.6	0.88	
Carlinville	91	27	58.5	2.63	
Centralia	92	31	60.6	2.94	
Chemung	83	23	52.4	0.66	
Chester	.....	.....	.....	1.92	
Cisne	91	29	59.1	3.09	
Coatsburg	87	31	57.5	0.94	
Cobden	92	35	61.8	1.97	
Danville	84	28	55.4	2.13	
Decatur	90	28	56.5	3.18	
Dixon	82	29	55.2	0.90	
Dwight	89	28	55.2	1.44	
Effingham	86	30	56.5	1.20	
Equality	88	30	60.0	4.74	
Flora	87	30	57.8	2.95	
Friendgrove	.....	.....	.....	3.98	
Galva	85	28	55.2	1.17	
Grafton	.....	.....	.....	1.86	
Grayville	86	36	59.4	3.94	
Greenville	92	34	59.8	2.35	
Griggsville	89	32	59.0	1.80	
Halfway	87°	34°	60.0°	2.77	
Halliday	90	27	59.2	1.95	
Havana	88	25	56.2	0.66	
Henry	88	26	55.8	0.83	
Hillsboro	89	32	58.6	2.31	
Joliet	85	30	53.4	0.85	
Kishwaukee	85	25	53.0	0.82	
Knoxville	85	24	54.0	0.91	
Lagrange	85	30	53.4	1.65	
Laharpe	84	27	55.4	0.85	
Lanark	81	23	52.2	1.39	
La Salle	85	29	56.8	0.56	
Loami	.....	.....	.....	1.69	
McLeansboro	88	31	59.4	2.33	
Martinton	89	24	54.7	2.90	
Mascoutah	87	29	57.2	2.76	
Mattoon	90	34	60.8	3.45	
Melrose	87	27	57.2	2.40	
Minonk	89	25	55.6	0.75	
Monmouth	85	26	55.4	1.03	
Monticello	90	29	56.4	2.47	
Morgan Park	.....	.....	.....	1.35	
Morrison	84	25	53.2	0.83	
Morrisonville	90	29	57.8	3.27	
Mount Carmel	.....	.....	.....	4.43	
Mount Pulaski	90	31	57.0	1.98	
Mount Vernon	90	32	58.4	2.25	
New Burnside	88	31	60.6	3.92	
Olney	86	32	58.2	2.49	
Ottawa	87	30	56.3	0.91	
Palestine	86	29	55.9	2.79	
Pana	89	34	57.6	2.64	
Paris	82	34	57.4	3.61	
Peoria *a*	.....	.....	.....	0.75	
Peoria *b*	86	31	56.2	0.90	
Philo	87	25	55.0	3.57	
Plumhill [f]	86	34	60.2	2.74	
Rantoul	88	31	56.7	3.32	
Raum	84	38	61.2	5.45	
Riley	86	26	53.6	0.86	
Robinson	88	32	57.8	3.74	
St. John	91	29	59.0	2.71	
Scales Mound	82	24	53.4	1.72	
Shobonier	91	26	57.6	2.59	
Strawn	87	29	58.8	3.22	
Streator	88	21	54.8	0.63	
Sullivan	90	30	57.8	2.84	
Sycamore	85	26	52.9	0.71	
Tilden	90	28	59.6	2.28	
Tiskilwa	83	27	55.3	0.70	
Tuscola	90	29	56.2	3.44	
Walnut	84	29	56.4°	0.82	
Wellington	86	31	55.6	2.80	
Winchester	91	29	57.8	3.36	
Winnebago	85	24	58.7	0.92	
Yorkville	89	25	53.9	1.08	
Zion	83	27	53.6	2.84	
Indiana.					
Anderson	80	28	56.0	3.54	
Angola	78	27	52.6	6.15	
Auburn	80	28	52.5	3.71	
Bloomington	81	35	60.3	4.08	
Bluffton	84	25	54.7	3.40	
Butlerville	81	27	56.5	1.36	
Cambridge City	78	25	52.8	1.58	
Columbus	83	28	55.8	2.33	
Connersville	80	27	53.5	1.29	
Crawfordsville	85	30	57.8	3.90	
Delphi	85	25	54.2	5.06	
Edwardsville *[1]	78	38	59.9	1.44	
Farmland	78	28	54.8	2.02	
Franklin *[1]	80	34	55.6	3.33	
Greencastle	79	35	56.2	4.85	
Greensburg	76	26	56.1	1.69	
Hammond	83	31	55.6	1.72	
Hector	87	28	55.0	1.81	
Huntington	81	30	53.0	5.53	
Jeffersonville	80	34	57.7	0.67	
Knightstown	80	28	54.9	2.58	
Kokomo	79	33	55.0	4.64	
Lafayette	85	29	56.1	4.78	
Laporte	86	30	55.4	4.19	
Logansport	84	28	53.0	4.47	
Madison *a*	81	30	57.6	0.92	
Madison *b*	.....	.....	.....	0.88	
Marengo	81	29	54.8	2.66	
Marion	83	26	55.7	4.00	
Markle	82	25	54.3	2.90	T.
Mauzy	81	27	55.4	2.10	
Northfield	80	27	53.6	3.12	
Paoli	83	29	58.2	3.89	
Prairie Creek	90	30	58.0	3.42	
Princeton	85	29	56.4	3.20	
Rensselaer	82	27	55.1	4.38	
Richmond	79	25	53.7	1.49	
Rockville	82	31	56.2	4.22	
Salem	82	26	56.6	1.85	
Scottsburg	80	29	57.0	1.35	
Seymour	79	31	55.9	2.00	
South Bend	85	29	55.2	3.95	
Syracuse	84	26	54.6	6.85	T.
Terre Haute	85	26	57.9	3.06	
Topeka	80	28	53.6	7.08	
Valparaiso	85	29	53.8	3.38	
Veedersburg	83	28	58.8	4.45	
Vevay	83	34	57.8	0.60	
Vincennes	89	33	57.9	4.90	
Washington	85	31	57.3	3.94	
Winamac	84	22	53.6	6.06	
Worthington	87	29	56.8	4.67	
Indian Territory.					
Ardmore	96	39	70.1	1.24	
Bengal	87	31	63.2	1.85	
Chickasha	93	32	66.8	0.88	
Durant	92	35	67.4	1.27	
Fairland	90	33	63.2	2.39	
Hartshorne	92	33	68.8	2.20	
Healdton	96	33	67.7	1.40	
Holdenville	92	35	65.7	4.75	
Marlow	93	34	66.8	1.31	
Muscogee	93	34	66.0	4.69	
Pauls Valley *b*	93	31	67.3	1.30	
Roff	94	40	69.0	1.43	
Ryan	92	41	69.0	0.65	
South McAlester	.....	.....	.....	2.10	
Tahlequah	93	36	64.6	2.10	
Tulsa	.....	.....	.....	2.37	
Wagoner	93	39	65.2	3.25	
Webbers Falls	99	31	65.4	2.60	
Iowa.					
Afton	79	26	55.0	2.82	
Albia	81	28	55.2	1.26	
Algona	78	32	53.6	1.07	
Alta	79	29	52.0	1.87	
Amana	80	24	54.4	1.48	
Ames *b*	81	27	53.9	2.98	
Atlantic	83	22	53.4	2.80	
Battle Creek	.....	.....	.....	1.39	
Baxter	83	28	55.0	2.28	
Belknap	83	30	57.8	0.93	
Belleplaine	81	28	53.8	1.54	
Bonaparte	83	28	57.0	0.90	
Britt	79	25	50.2	1.49	T.
Buckingham	.....	.....	.....	1.32	
Burlington	85	32	58.0	1.08	
Bussey	.....	.....	.....	1.33	
Carroll	82	27	54.0	3.12	T.
Cedar Rapids	82	28	55.5	1.37	
Centerville	85	29	57.0	2.05	
Chariton	85	26	56.0	1.70	
Charles City	79	27	51.0	2.37	T.
Clarinda	86	27	57.1	4.03	
Clearlake	86	30	54.0	2.40	T.
Clinton	83	26	53.6	0.81	
College Springs	80	29	56.5	1.35	
Columbus Junction	83	30	55.0	1.34	T.
Corning	79	24	54.2	3.57	
Council Bluffs	83	51	56.5	1.88	
Cresco	79	26	51.0	2.25	T.
Cumberland	.....	.....	.....	2.46	
Danville	.....	.....	.....	1.56	
Decorah [d]	80	28	51.2	.....	
Delaware	78	25	51.8	2.17	
Denison	80	26	52.8	2.26	
Desoto	78	29	55.4	2.55	
Dows	81	20	52.4	3.00	T.
Eldon	85	26	56.2	1.41	
Elkader	88	25	54.0	2.53	
Emerson	.....	.....	.....	2.30	
Estherville	80	26	49.2	0.94	T.
Fayette	80	22	51.2	2.32	T.
Fonda	.....	.....	.....	2.34	T.
Forest City	81	28	52.6	1.21	T.
Fort Dodge	82	26	53.0	4.20	
Fort Madison	.....	.....	.....	1.09	
Galva	80°	26°	52.6°	1.91	
Gilman	.....	.....	.....	2.09	
Glenwood	82	28	56.6	2.64	
Grand Meadow	78	29	51.8	2.95	T.
Greene	81	27	52.6	3.18	T.
Greenfield	86	29	56.3	2.74	
Grinnell	79	30	56.6	1.63	
Grinnell (near)	81	30	55.8	1.81	
Grundy Center	82	25	54.0	2.03	
Guthrie Center	82	26	54.3	2.15	
Hampton	86	29	54.2	2.88	
Harlan	86	25	53.7	3.25	
Hopeville	80	32	56.2	2.39	T.
Humboldt	80	29	52.6	1.91	
Independence	80	25	52.5	2.38	
Indianola	82	27	55.8	2.51	
Iowa City	83	27	55.6	1.78	
Iowa Falls	80	22	51.8	2.39	T.
Jefferson	.....	.....	.....	2.74	
Keosauqua	82	30	57.0	0.97	
Knoxville	82	29	57.0	1.17	
Lacona	.....	.....	.....	1.85	
Larchwood	.....	.....	.....	1.00	
Leclaire	.....	.....	.....	0.60	
Lemars	78	24	52.4	1.74	
Lenox	78	30	55.5	2.77	
Logan	77	22	52.2	2.83	
Maple Valley	.....	.....	.....	1.84	
Maquoketa	84	23	54.6	1.62	
Marshalltown	83	25	55.5	2.27	
Monticello	82	23	52.6	1.97	
Mooar	84	27	55.6	1.52	
Mountayr	81	29	56.8	2.36	
Mount Pleasant	80	25	53.8	0.79	
Mount Vernon *b*	84	29	56.8	1.48	
New Hampton	79	26	51.7	2.82	T.
Newton	80	30	55.5	1.80	
Northwood	80	28	52.0	1.35	T.
Odebolt	80	27	53.2	0.57	
Ogden	83	26	53.5	3.31	
Olin	80	25	52.8	1.44	
Onawa	84	29	54.2	2.19	
Osage	78	29	51.4	2.79	T.
Osceola	82	30	56.7	1.41	
Oskaloosa	82	28	55.8	1.30	
Ottumwa	81	31	57.0	1.35	
Ovid	86	27	56.2	2.73	
Pacific Junction	80	28	53.6	2.99	
Pella	86	27	57.2	1.92	
Plover	80	27	51.6	2.00	T.
Primghar	.....	.....	.....	1.65	
Redoak	76	33	56.4	2.30	
Ridgeway	82	30	53.4	3.38	T.
Rockwell City	80	30	53.8	1.95	
Ruthven	.....	.....	.....	2.17	
Sac City	81	28	53.2	1.70	T.
St. Charles	85	30	57.8	2.78	
Scranton	80	29	54.4	2.34	
Sheldon	83	25	51.8	1.22	T.
Sibley	81	25	51.8	1.04	T.
Sigourney	82	27	55.8	2.29	
Sioux Center	78	27	52.9	1.26	
Stockport	.....	.....	.....	1.05	
Storm Lake	77	29	52.3	1.88	T.
Thurman	80	28	55.0	4.23	
Tipton	82	26	55.6	1.40	
Toledo	84	23	54.8	2.01	
Vinton *[1]	83°	26	53.4	1.31	
Wapello	80	32	55.6	0.56	
Washington	84	27	54.6	1.32	
Washta	.....	.....	.....	1.77	T.
Waterloo	84	26	53.7	2.18	T.
Waverly	81°	28b	53.8°	3.41	T.
Westbend	81	28	51.7	1.14	T.
West Union	.....	.....	.....	2.32	
Whitten	80	21	51.6	1.69	T.
Wilton Junction	80	24	53.7	1.18	
Winterset	83	27	57.0	2.95	
Woodburn	.....	.....	.....	1.51	
Kansas.					
Abilene	80	29	60.4	1.69	
Achilles	87	21	54.0	0.47	
Altoona	93	31	63.2	2.27	
Anthony	.....	.....	.....	1.80	
Atchison	84	33	60.8	2.60	

TABLE II.—*Climatological record of voluntary and other cooperating observers.*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Kansas—Cont'd.	°	°	°	*Ins.*	*Ins.*
Beloit	84	.....	.....	1.32	
Burlington	91	28	61.8	1.33	
Chanute	94[d]	31[d]	65.0[d]	2.13	
Colby	86	22	55.2	0.64	
Columbus	88	32	61.8	2.22	
Coolidge	85	22	55.4	0.65	
Delphos	86	24	60.2	0.75	
Dresden	84	28	56.8	0.73	
Ellinwood	82	31	59.2	3.59	T.
Emporia	84	34	60.8	2.20	
Englewood	92	32	61.3	2.34	
Eureka Ranch	84	27	58.1	1.91	
Fallriver	92	30	62.8	1.82	
Farnsworth[*1]	84	33	56.7	0.37	
Fort Leavenworth	85	35	61.0	1.20	
Fort Scott	93	32	63.4	0.90	
Frankfort	85	27	59.8	2.50	
Garden City	83	30	59.4	0.60	
Gove[*1]	85	32	57.6	2.11	
Grenola	93	28	62.4	3.32	
Hanover	83	28	61.0	3.41	
Harrison	85	27	58.4	1.23	
Horton	83	31	59.6	2.04	
Hoxie	84	25	57.2	1.15	
Hutchinson	87	28	59.3	6.30	
Independence	93	33	63.9	2.48	
Jetmore	88	31	59.3	0.95	
Lakin	85	30	56.9	0.15	
Lawrence	83	34	60.9	1.93	
Lebanon	82	25	57.2	T.	
Lebo	90	31	61.8	1.14	
Leoti	87	27	54.4	0.35	
Little River	82	31	60.4	2.58	
Macksville	82	31	59.6	3.37	
McPherson	83	30	61.6	4.49	
Madison	88	26	60.5	1.89	
Manhattan[c]	85	28	60.8	1.98	
Marion	84[e]	28[f]	61.6[f]	4.15	
Medicine Lodge	89	32	62.0	3.52	
Minneapolis	84	27	61.2	1.59	T.
Moran	97	30	63.2	1.09	
Mounthope[*1]	83	35	60.8	4.80	
Ness City	83[d]	32[d]	59 0[d]	1.00	
Newton	85	30	60.2	4.39	T.
Norwich	89	32	62.2	2.85	
Oberlin	.....	.....	.....	0.50	
Olathe	85	29	60.6	0.56	
Osage City	86	28	60.7	1.79	
Osborne	.....	.....	.....	0.90	
Oswego	94	32	64.2	2.16	
Ottawa	88	26	60.2	0.65	
Phillipsburg	84	28	58.8	1.60	
Pratt	84	32	60.3	3.58	
Rome	94	28	63.6	1.70	
Salina	86	30	61.9	2.43	
Scott	84	25	55.0	.....	
Sedan	91	38	63.2	2.70	
Seneca	84	30	59.2	2.04	
Toronto	91	29	60.6	2.12	
Tribune	82	26	55.0	0.34	
Ulysses	86[b]	28[b]	57.4[b]	0.20	
Valley Falls	82	30	60.3	2.36	
Viroqua	86	30	57.9	1.21	
Wakeeney (near)	.....	.....	.....	2.30	
Wallace	.....	.....	.....	1.67	
Wamego[*1]	81	30	58.6	1.85	
Winfield	89	30	62.3	1.75	
Yates Center	.....	27	.....	1.97	T.
Kentucky.					
Alpha	84	34	60.6	1.06	
Anchorage	84	28	56.9	0.74	
Bardstown	85	29	58.8	0.69	
Berea	82	33	58 8	0.83	
Blandville	81	35	59.7	4.50	
Bowling Green	80	28	55.8	0.62	
Burnside	82	32	57.0	0.31	
Carrollton	82	34	57.8	0.46	
Catlettsburg	80	31	56.6	0.19	
Centertown	86	31	58.8	1.89	
Earlington	87	33	60.0	3.80	
Edmonton	84	29	57.6	1.15	
Eubank	80	28	54.6	1.30	
Falmouth	.....	.....	.....	0.84	
Fords Ferry	88	27	58.6	5.75	
Frankfort	78	31	56.0	0.55	
Franklin	85	35	60.7	0.55	
Georgetown	79	30	57.5	.....	
Greensburg	93	31	57.4	0.97	
Henderson	83	36	59.0	5.45	
Hopkinsville	83	32	59.4	1.92	
Irvington	79	30	56.6	1.26	
Leitchfield	80	31	57.0	0.89	
Loretto	82	25	56.5	0.82	
Manchester	88	31	58.9	0.65	
Marrowbone	81	28	57.6	0.90	
Maysville	84	28	56.6	0.98	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Kentucky—Cont'd.	°	°	°	*Ins.*	*Ins.*
Mount Sterling	79	29	54.7	1.05	
Owensboro	82	34	59.5	2.98	
Owenton	76	34	54.2	1.15	
Paducah[a]	.....	.....	.....	6.22	
Paducah[b]	87	38	62.4	6.05	
Pikeville[*]	85	31	59.8	0.59	
St. John	79	29	56.2	0.79	
Scott	84	29	57.4	0.65	
Shelby City	84	26	56.4	0.99	
Shelbyville	83	27	56.6	0.96	
Warfield	82[d]	30[d]	57.5[d]	0.50	
Williamsburg	83	33	59.6	0.64	
Louisiana.					
Abbeville	89	45	69.1	2.25	
Alexandria	95	37	67.0	0.68	
Amite	88	40	66.2	3.99	
Baton Rouge	90	42	67.6	1.82	
Burnside	89	39	67.0	5.17	
Calhoun	85	38	62.6	2.53	
Cameron	90	46	69.3	3.01	
Cheneyville	91	36	65.9	0.65	
Clinton	86	38	66.4	1.42	
Collinst n	90	37	65.6	2.89	
Covington	93	39	68.6	5.19	
Donaldsonville	90	45	70.6	1.90	
Emilie	86	45	66.9	1.93	
Farmerville	82	41	65.2	3.61	
Franklin	90	43	68.1	1.07	
Grand Coteau	90	41	66.8	1.01	
Hammond	91	42	68.5	2.26	
Houma	90	40	67.5	3.65	
Jeanerette	.....	.....	.....	2.30	
Jennings	91	40	67.6	1.55	
Lafayette	92	39	67.2	1.67	
Lake Charles	91	45	69.0	2.97	
Lake Providence	89	39	66.2	1.65	
Lawrence	87	51	70.1	3.43	
Libertyhill	93	37	65.6	4.25	
Mansfield	93	36	65.4	2.43	
Melville	92	38	65.8	1.30	
Minden	96	38	66.8	3.65	
Monroe	92	38	66.2	1.99	
New Iberia	82	46	67.0	1.65	
Opelousas	90	38	66.2	0.81	
Oxford	90[d]	36[d]	64.4[d]	2.70	
Paincourtville	86	42	66.1	2.02	
Plain Dealing	92	35	64.6	4.58	
Prevost	.....	....	.....	2.10	
Rayne	91	40	68.2	1.28	
Robeline[s]	85	35	62.6	1.45	
Ruddock	88	47	67.6	1.82	
Schriever	90	38	67.1	1.84	
Southern University	86	42	65.8	2.93	
Sugar Ex. Station	85	46	68.0	2.91	
Sugartown	89	43	67.0	1.03	
Venice	85	49	70.2	2.40	
Wallace	92	41	67.6	2.40	
White Sulphur Springs	94	37	67.4	1.18	
Maine.					
Bar Harbor	68	23	48.7	3.45	T.
Belfast	67	22	47.6	3.58	T.
Bemis	67	25	44.2	2.75	
Calais	70	20	47.2	3.23	0.8
Cornish	71	25	48.8	3.47	T.
Fairfield	71	21	48.5	2.77	
Farmington	73	19	47.0	3.03	T.
Flagstaff	70[d]	18[d]	41.2[d]	2.40	T.
Gardiner	71	24	49.2	4.18	
Kineo	66	28	42.4	2.26	T.
Lewiston	75	26	49.8	3.33	
Mayfield	69	23	46.9	3.43	T.
North Bridgton	77	24	49.3	3.24	T.
Orono	71	20	47.2	4.12	T.
Rumford Falls	70	20	45.4	3.48	T.
Winslow	73	18	48.6	3.28	T.
Maryland.					
Annapolis	82	35	58.9	1.20	
Bachmans Valley	75	28	52.5	2.00	
Boettchervilie	81	27	53.8	0.21	
Boonsboro[a]	78	29	54.2	1.54	
Cambridge	79	40	59.2	1.50	
Charlotte Hall	83	30	54.6	0.98	
Chase	77	26	53.6	0.53	
Cheltenham	85	30	56.2	1.08	
Chestertown	76	35	55.0	1.06	
Chewsville	82	25	54.0	0.89	
Clearspring	80	30	54.2	0.85	
Coleman	.....	.....	.....	1.60	
Collegepark	83	25	53.8	1.47	
Colora	.....	....	....	1.19	
Cumberland[b]	.....	.....	.....	0.30	
Darlington	79	30	54.4	1.20	
Deerpark	77	16	48.9	0.87	T.
Easton	80	32	56.4	1.68	
Fallston	79	31	54.7	1.89	
Frederick	79	32	56.5	1.22	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Maryland—Cont'd.	°	°	°	*Ins.*	*Ins.*
Frostburg	76	28	51.4	0.54	T.
Grantsville	77	25	51.6	0.76	
Greatfalls	81	28	53.9	0.28	
Greenspring Furnace	80	29	52.9	0.77	
Hancock	82[d]	24	53.8	0.91	
Harney	.....	.....	.....	1.10	
Jewell	82	34	56.2	1.34	
Johns Hopkins Hospital	82	33	55.4	1.63	
Laurel	84	26	53.8	1.33	
Longwoods	.....	.....	.....	1.31	
McDonogh	92	30	52.4	1.22	
Mount St. Marys Coll	78	33	55.2	1.21	
Newmarket	79	31	55.2	1.80	
Pocomoke	81	32	56.0	1.32	
Princess Anne	79	29	55.8	1.12	
Queenstown	78	33	56.6	1.41	
Rockhall[b]	79	29	55.6	1.08	
Sharpsburg	80	29	55.0	1.42	
Smithsburg[a]	80	25	53.5	0.71	
Smithsburg[b]	78	29	54.8	1.37	
Solomons	80	40	59.8	1.58	
Sudlersville	81	32	55.8	1.47	
Sunnyside	78	17	50.4	0.98	T.
Takoma Park	83	32	55.2	1.24	
Taneytown	79	31	54.2	0.94	
Van Bibber	78	32	55.0	1.70	
Westernport	76	26	51.4	0.33	
Woodstock	79	32	56.4	0.81	
Massachusetts.					
Amherst	73	24[d]	49.9	4.17	T.
Bedford	74	24	51.6	2.69	
Bluehill (summit)	73	31	52.3	3.75	
Cambridge	75	28	52.8	2.87	
Chestnuthill	76	28	53.4	3.01	
Cohasset	.....	.....	.....	4.24	
Concord	76	22	50.9	2.91	
East Templeton[*1]	72	28	47.8	3.21	T.
Fallriver	74	34	54.6	2.65	
Fitchburg[a*1]	72	30	49.5	3.52	
Fitchburg[b]	73	27	51.2	3.46	T.
Framingham	75	27	52.6	2.57	
Groton	75	21	50.0	3.26	
Hyannis	.....	...	.....	0.86	
Jefferson	.....	.....	.....	3.96	T.
Lawrence	75	26	52.2	2.63	
Leominster	.....	...	.....	3.15	T.
Lowell[a]	78	26	53.1	3.43	
Lowell[b]	75	26	52.3	.....	
Ludlow Center	72	22	52.0	4.87	
Middleboro	74	22	50.4	3.21	
Monson	74	24	50.0	3.53	
New Bedford[a]	71	34	53.6	2.12	
Pittsfield	73	24	48.2	1.84	
Plymouth[*1]	70	35	51.3	2.27	
Princeton	.....	.....	.....	3.77	
Provincetown	82	34	55.2	1.24	
Somerset[*1]	78	28	54.2	3.12	
Springfield Armory	78	28	52.4	4.31	
Sterling	.....	.....	.....	3.34	
Taunton	73	20	50.4	2.64	
Westboro	73	29	53.2	3.05	
Weston	73	26	50.6	2.78	
Williamstown	71	25	48.8	1.91	T.
Winchendon	.....	.....	.....	3.52	T.
Worcester	75	31	52.6	3.35	
Michigan.					
Adrian	80	26	52.0	3.46	T.
Agricultural College	79	22	49.6	4.61	T.
Allegan	84[d]	28[d]	52.4[d]	3.55	
Alma	81	22	50.9	2.97	T.
Ann Arbor	79	26	52.0	2.55	
Annpere	.....	.....	.....	1.40	
Arbela	78	24	50.4	2.10	T.
Baldwin	75	20	49.2	2.00	
Ball Mountain	76	24	50.2	2.95	T.
Battlecreek	82	28	52.8	4.17	T.
Bay City	80	25	50.8	4.10	T.
Benzonia	75	27	48.8	4.20	T.
Berlin	75	24	50.0	1.54	T
Berrien Springs	84	28	54.8	4.03	0.5
Big Rapids	76	20	48.0	2.57	T.
Birmingham	78	25	51.6	0.70	
Boon	73	18	45.6	4.39	T.
Calumet	72	26	45.0	2.29	T.
Carsonville	79	18	48.8	1.42	
Cassopolis	85	23	54.2	5.25	
Charlevoix	74	30	51.6	4.06	
Chatham	74	18	44.4	5.44	2 0
Cheboygan	86	24	48.4	3.05	T.
Clinton	80	23	52.6	2.88	
Coldwater	80	26	53.2	6.56	
Deerpark	69	25	46.0	6.54	1.8
Detour	62	25	45.8	5.12	1.5
Dundee	78[e]	27[e]	51.8[e]	1.71	
Eagle Harbor	77	29	47.6	2.67	T.
East Tawas	75	27	49.3	3.55	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Michigan—Cont'd.	°	°	°	*Ins.*	*Ins.*
Eloise	80	26	52.6	1.75	T.
Ewen	70	23	42.5	0.90	
Fairview	72[d]	23	49.8	4.00	
Fennville	82	29	53.6	3.20	
Fitchburg	80	22	51.9	4.67	
Flint	79	24	51.3	3.01	
Frankfort	.....	.....	.....	1.40	T.
Gaylord	74	10	45.6	4.50	5.0
Grand Marais[b]	70	27	45.0	5.59	2.0
Grand Rapids	84	25	52.8	3.24	T.
Grape	80[e]	25[e]	53.0[e]	1.78	T.
Grayling	76	22	48.2	4.40	2.2
Hanover	81	24	53.4	4.50	
Harbor Beach	79	24	52.2	2.58	T.
Harrisville	77	22	48.0	3.44	T.
Hastings	84	24	51.2	3.34	
Hayes	77	25	49.2	2.38	T.
Highland Station	.....	.....	.....	3.40	T.
Hillsdale	79	25	52.0	5.63	T.
Humboldt	77	7	41.7	2.09	T.
Ionia	84	25	50.5	3.61	
Iron Mountain	80	24	47.8	.....	T.
Ironwood	79	28	48.2	2.24	
Ishpeming	78	20	45.8	3.92	1.0
Ivan	74	21	47.4	4.48	1.5
Jackson	79	26	53.0	4.80	
Jeddo	76	25	51.2	1.35	
Kalamazoo	76	31	51.6	2.98	
Lake City	72	20	48.0	1.50	
Lansing	80	25	50.6	4.87	T.
Lapeer	76	25	51.0	1.79	T.
Lathrop	70	27	45.8	2.86	
Lincoln	75	20	48.6	3.10	T.
Ludington	71	30	47.6	1.93	T.
Mackinac Island	66	26	47.2	2.11	1.0
Mackinaw	76	26	48.2	4.56	
Mancelona	75	24	47.7	5.95	4.0
Manistee	73	26	50.7	3.40	T.
Manistique	65	25	45.8	5.64	T.
Menominee	78	27	50.1	4.47	
Midland	82	25	52.1	3.19	T.
Mio	86	19	47.4	4.40	1.0
Mount Clemens	82	23	49.6	0.98	
Mount Pleasant	82	20	49.0	2.18	
Muskegon	73	29	52.2	1.82	
Newberry	72	27	48.9	2.48	2.0
North Marshall	76	25	51.0	3.60	T.
Old Mission	75	29	49.8	3.99	T.
Olivet	78	29	51.4	5.30	T.
Omer	78	13	48.0	2.17	
Onaway	73	21	47.2	3.40	T.
Ontonagon	78	27	46.6	1.97	
Ovid	80	25	51.5	4.17	
Owosso	82	25	53.4	2.80	
Petoskey[b]	76	27	46.5	0.75	1.0
Plymouth	80	26	51.2	2.20	
Pontiac[f]	77	25	51.3	2.57	
Port Austin	79	22	52.4	1.82	
Reed City	75	26	49.8	3.39	
Saginaw	81	24	52.6	3.27	T.
St. Ignace	73	26	48.4	5.34	T.
St. Johns	82	25	53.0	3.02	
St. Joseph	77	28	51.6	4.72	
Somerset	80	25	52.0	3.55	
South Haven	86	30	53.2	4.44	
Stanton	88	22	50.2	1.14	
Thomaston	79	20	43.8	0.80	
Thornville	75	28	51.4	3.12	T.
Traverse City	78	27	50.2	4.38	0.5
Vassar	77	23	49.8	2.44	
Wasepi	82	28	53.8	5.70	
Waverly	80	25	51.9	2.04	T.
West Branch	74	21	47.8	2.80	T.
Whitecloud	77	30	49.2	1.80	
Whitefish Point	67	27	45.8	7.77	T.
Ypsilanti	77	24	51.6	2.24	
Minnesota.					
Ada	82	21	46.6	2.25	
Albert Lea	81	27	50.6	0.95	
Alexandria	77	25	50.4	1.16	
Ashby	78	26	49.0	1.52	
Beardsley	84	24	49.5	0.82	
Bemidji	75	23	47.4	9.56	
Bird Island	84	22	51.2	1.63	
Blooming Prairie	79	26	49.3	0.35	T.
Brainerd	82	22	48.0	1.92	T.
Caledonia	79	26	50.6	2.71	T.
Collegeville	82	30	50.3	0.62	
Crookston	75	25	47.2	2.00	
Currie	.....	25	.....	.....	
Deephaven	.....	.....	.....	0.71	
Detroit City	77	30	47.0	4.22	
Faribault	79	27	50.4	1.93	T.
Farmington	80	27	52.8	3.34	
Fergus Falls	73	27	48.0	2.82	
Glencoe	82	20	49.0	0.82	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Minnesota—Cont'd.	°	°	°	*Ins.*	*Ins.*
Grand Meadow	81	24	48.9	2.98	T.
Hallock	75	19	45.3	1.81	T.
Hovland	.....	.....	.....	2.45	T.
Lake Jennie	84	25	52.0	1.50	
Lakeside	78	21	50.0	1.45	
Lake Winnibigoshish	72	22	46.8	4.53	T.
Leech	75	21	46.6	3.72	T.
Long Prairie	82	19	49.2	1.57	
Luverne	75	.....	.....	1.93	T.
Lynd	81	23	53.2	0.95	T.
Mapleplain	81	25	50.8	0.77	
Milaca	84	20	48.6	1.44	
Milan	85	22	50.1	0.63	
Minneapolis[b1]	80*	25	49.7	0.86	
Montevideo	83	23	49.8	0.66	
Morris	83	28	50.4	1.18	
Mount Iron	76	18	43.5	3.35	T.
Newfolden	74	19	43.7	3.00	
New London	80	25	48.4	0.62	
New Richland*[1]	80	30	50.8	.....	
New Ulm	81	33	52.8	0.80	
Park Rapids	76	20	46.0	3.55	
Pine River	80	21	48.5	2.67	
Pipestone	75	29	48.8	1.08	T.
Pleasant Mounds	83	26	52.6	1.03	T.
Pokegama Falls	77	13	43.6	2.67	
Redwing *a*	.....	.....	.....	1.56	
Redwing *b*	78	28	52.0	1.55	T.
Reeds	.....	.....	.....	2.10	
Rolling Green	78	29	50.6	1.00	T.
St. Charles	83	26	52.3	3.05	
St. Cloud	84	19	51.2	0.76	
St. Peter	84	27	51.4	2.42	
Sandy Lake Dam	79	22	46.4	1.90	
Shakopee	80	25	51.4	0.75	
Tower	74	18	43.8	1.50	T.
Two Harbors	80	21	44.3	1.99	T.
Wabasha*[2]	.....	28	48.4	2.25	T.
Warroad[1]	72	24	49.3	.....	
Willmar	80	22	49.0	0.72	
Willow River	86	20	48.0	1.61	T.
Winnebago City	81	27	51.2	0.80	
Worthington	76	31	51.0	0.93	T.
Wyoming	.....	.....	.....	0.55	
Zumbrota[1]	78*	24	50.8	.....	
Mississippi.					
Aberdeen	88	30	59.6	1.10	
Agricultural College	87	40	65.0	1.25	
Austin	85	37	62.2	2.00	
Batesville	85	34	60.5	0.79	
Bay St. Louis	88	48	68.7	3.81	
Biloxi	85	46[c]	68.4	0.34	
Booneville	82	38	63.1	1.24	
Brookhaven	90	39	65.6	3.85	
Canton	88	36	64.2	2.72	
Cleveland	90	35	61.4	0.46	
Columbus *a*	.....	.....	.....	1.22	
Columbus *b*	86	40	63 0	1.18	
Corinth	82	38	60.3	1.38	
Crystalsprings	88	40	65.6	3.01	
Edwards	87	40	65.8	3.80	
Fayette	87	38	65.0	1.75	
Fayette (near)*[1]	86	40	66.7	1.11	
Greenville *a*	85	41	64.0	0.85	
Greenville *b*	90	40	65.8	0.90	
Hattiesburg	86	41	64.2	0.26	
Hazlehurst	92	47	68.8	3.20	
Hernando	83	41	62.9	1.80	
Holly Springs	82	41	63.4	1.16	
Indianola	86	31	62.2	1.20	
Jackson	93	38	66.6	1.95	
Lake	85	36	61.6	1.78	
Leakesville	90	36	65.4	1.79	
Louisville	87	37	63.8	1.95	
Macon	90	36	61.8	0.35	
Magnolia	89	36	65.0	1.05	
Natchez	90	42	67.7	0.20	
Nittayuma	88	37	63.8	2.43	
Okolona	85	35	60.2	0.15	
Palo Alto	87	39	63.0	0.91	
Pearlington	88	40	66.4	3.47	
Pittsboro	89	35	63.6	1.10	
Pontotoc	85	39	63.0	1.48	
Poplarville	85	49	68.4	1.56	
Port Gibson	91	35	64.3	1.05	
Ripley	83	34	60.2	1.37	
Shoccoe	.....	.....	.....	2.25	
Stonington*[1]	88	40	66.3	1.53	
Suffolk	88	37	65.0	2.36	
Swartwout	.....	.....	.....	1.69	
Thornton	89	44	66.0	1.71	
Tupelo	.....	.....	.....	1.34	
Walnutgrove	.....	.....	.....	1.90	
Watervalley	89	37	66.4	0.72	
Waynesboro	89	41	67.0	1.50	
Woodville	87	42	66.0	0.62	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Mississippi—Cont'd.	°	°	°	*Ins.*	*Ins.*
Yazoo City	90	38	64.6	1.00	
Missouri.					
Appleton City	96	30	61.2	0.94	
Arthur	86	28	60.6	1.13	
Avalon	89	31	61.6	1.65	
Bethany	84	25	56.2	1.48	
Birchtree	87	31	60.2	0.67	
Boonville	.....	.....	.....	1.13	
Brunswick	86	33	58.4	1.17	
Carrollton	.....	.....	.....	1.12	
Conception	80	35	58.4	1.21	
Dean	89	29	62.5	1.60	
Desoto	92	30	62.4	1.36	
Downing	.....	.....	.....	1.65	
Edgehill*[b]	84	30	55.8	0.75	
Edwards	83[b]	28[f]	58.7[d]	1.57	
Eightmile*[3]	.....	33	58.3	2.53	
Eldon	94	29	60.8	2.12	
Fairport	.....	.....	.....	1.72	
Fayette	87	33	59.8	0.94	
Fulton	90	29	59.9	1.16	
Galena	.....	.....	.....	1.32	
Gallatin*[1]	86	32	60.3	1.59	
Gayoso	82	31	60.2	2.63	
Glasgow	90	30	60.0	0.86	
Gorin	.....	.....	.....	1.20	
Halfway	87	30	61.2	1.03	
Harrisonville	87	29	59.2	1.65	
Hazlehurst	.....	.....	.....	1.21	
Hermann	.....	.....	.....	2.46	
Houston	91	31	60.8	2.63	
Irena	.....	.....	.....	2.22	
Ironton	92	24	59.4	1.18	
Jackson	90	27	59.8	2.68	
Kidder	83	32	58.8	2.10	
Koshkonong	89	34	63.0	0.89	
Lamar	88	31	62.6	1.87	
Lamonte	.....	.....	.....	1.27	
Lebanon	88*	31	61.1	1.38	
Lexington	89	31	61.8	1.27	
Liberty	89	32	59.9	2.21	
McCune*[1]	90	32	58.3	1.79	
Macon	88	34	59.7	0.91	
Marblehill	90	28	59.7	1.77	
Marshall	88	30	60.2	1.16	
Maryville	81	29	55.9	2.36	
Mexico	93	31	61.1	1.06	
Miami*[3]	86	36	59.5	0.85	
Mineralspring	85	31	61.7	1.72	
Monroe City	85	31	57.4	1.59	
Montreal	90	27	60.0	2.24	
Mountaingrove	86	30	61.0	2.61	
Mount Vernon	91	32	63.2[f]	2.05	
Neosho	86	30	62.0	3.03	
Nevada	.....	.....	.....	0.80	
New Haven	93	35	61.4	2.39	
New Madrid *b*	.....	.....	.....	2.85	
New Palestine	89	33	61.4	0.96	
Oakfield	92	35	61.4	3.00	
Oregon *a*	83	32	59.9	1.88	
Palmyra*[3]	84	32	56.8	0.66	
Phillipsburg*[1]	86	30	58.7	0.36[a]	
Pine Hill	.....	.....	.....	1.79	
Poplarbluff	88	32	60.8	1.90	
Potosi	92	26	58.0	1.81	
Princeton	85	31	58.4	1.14	
Richmond	86	35	60.9	1.32	
Rockport	.....	.....	.....	3.93	
Rolla	.....	.....	.....	2.29	
St. Charles	94	34	61.6	2.90	
St. Joseph	.....	.....	.....	2.05	
Sarcoxie*[3]	.....	30	57.4	2.86	
Sedalia	84	31	61.0	1.05	
Seymour	86	30	60.6	1.63	
Sikeston	87	32	60.3	2.16	
Steffenville	87	30	59.8	0.84	
Sublett	85	29	57.4	1.31	
Trenton	80	33	58.5	1.44	
Unionville	85	31	59.4	0.96	
Warrensburg	86	32[c]	61.6[g]	1.68	
Warrenton	91	34	59.2	3.37	
Wheatland	.....	.....	.....	1.30	
Willowsprings	81	31	57.8	0.47	
Windsor	87	30	60.7	1.31	
Zeitonia	92	30	60.0	1.43	
Montana.					
Adel	70	17	45.2	T.	
Anaconda	75	21	47.7	0.21	2.0
Augusta	71	26	49.6	0.07	1.0
Billings	76	28	53.2	.....	
Boulder	75	22	47.4	0.14	T.
Butte	68	30	48.3	0.45	
Canyon Ferry	74*	26*	49.3*	0.17	
Chester	75	20	47.0	0.01	
Columbia Falls	75	24	46.6	0.89	
Corvallis	.....	.....	.....	2.00	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Montana—Cont'd.	°	°	°	*Ins.*	*Ins.*
Crow Agency	76	29	51.4	0.51	
Culbertson	80	24	48.2	0.07	
Deerlodge	78	22	49.4	0.00	
Dell	76	23	45.3	0.35	
Dillon	75	25	49.0	0.43	
Fort Benton	75	30	51.1	0.10	
Fort Logan	68	22	46.4	0.11	
Glasgow	74	30	47.5	0.02	
Glendive	80	24	50.4	T.	T.
Glenwood	74	25	49.2	0.05	
Greatfalls	75	30	52.0	0.03	0.1
Kipp	73	18	46.6	0.22	2.0
Lewistown	80	25	49.6	0.50	3.0
Livingston	79	29	52.6	0.25	
Manhattan	71	22	47.1	0.01	
Martinsdale	75	28	49.3	0.00	
Marysville	69	28	48.2	0.40	
Missoula	75	29	50.2	0.47	T
Ovando	78	16	44.4	0.90	1.5
Parrot	75	26	50.4	0.23	
Plains	73	29	50.4	0.54	
Poplar	77	19	48.4	0.50	
Ridgelawn	80	20	49.2	0.25	
St. Pauls	77	25	51.2	0.25	0.5
St. Peter	73	24	49.0	0.09	T.
Toston	75	25	48.2	T.	
Troy	78	27	49.2	1.06	
Twin Bridges	70	24	45.4	.....	
Utica	76	25	51.8	1.39	4.0
Yale	68	15	44.6	0.07	T.
Nebraska.					
Agate	.....	.....	.....	0.83	T.
Agee *1	87	32	51.3	1.70	T.
Albion	85	28	54.2	2.09	
Alliance	81	24	53.8	1.10	T.
Alma	86	26	56.6	1.26	
Ansley	81	25	52.4	2.32	T.
Arapahoe	.....	.....	.....	0.54	
Arborville *1	84	32	54.1	2.61	
Arcadia	.....	.....	.....	2.10	
Arlington	.....	.....	.....	2.18	
Ashland *a*	84	30	56.8	2.16	
Ashland *b* *1	86	30	56.3	2.09	
Ashton	.....	.....	.....	3.78	
Auburn	86	27	57.6	2.88	
Aurora	84	23°	52.4	2.35	T,
Bartley	.....	.....	.....	0.77	
Beatrice	83	28	57.4	3.66	
Beaver	88	23	56.2	0.89	
Bellevue	.....	.....	.....	2.01	
Benedict	.....	.....	.....	2.00	
Benkleman	.....	.....	.....	0.45	
Blair	84	32	56.0	2.64	
Bluehill *1	80	32	57.2	1.86	
Bradshaw	.....	.....	.....	1.93	
Brokenbow	82	26	53.3	1.60	
Burwell	.....	.....	.....	1.76	
Callaway	80	25	53.2	1.90	
Camp Clarke	78	20	52.0	0.32	T.
Central City	.....	.....	.....	3.02	
Chester	.....	.....	.....	1.96	
Cody	.....	.....	.....	0.70	
Columbus	78	30	54.6	1.64	
Crete	82	29	57.4	2.62	
Cuibertson	.....	.....	.....	0.45	
Curtis	83°	26°	55.2°	0.60	
Dannebrog	.....	.....	.....	1.88	
David City	80	30	55.0	1.20	T.
Dawson	88	30	60.2	3.89	
Eden	.....	.....	.....	3.08	
Edgar *a* *5	82	31	57.0	1.22	
Ericson	.....	.....	.....	2.92	T.
Ewing	.....	.....	.....	2.04	
Fairbury	87	26	56.4	2.37	T.
Fairmont	82	26	55.5	2.35	
Fort Robinson	84	26	51.2	2.11	T.
Franklin	84	26	55.6	1.15	
Fremont	83	30	54.8	1.79	
Geneva	82	28	55.7	3.82	
Genoa	77	32	55.0	2.89	
Gering	75	28	50.8	0.98	T.
Gordon	.....	.....	.....	2.50	
Gosper	.....	.....	.....	1.32	
Gothenburg	85	25	53.0	0.84	
Grand Island *a*	.....	.....	.....	2.14	
Grand Island *b*	84	27	56.4	2.23	
Grand Island *c*	82	28	55.1	1.87	
Greeley	.....	.....	.....	1.90	
Guide Rock	.....	.....	.....	1.22	
Haigler	.....	.....	.....	T.	
Hartington	81	28	53.8	1.95	
Harvard	79	27	55.4	1.63	
Hastings *1	79	33	55.7	1.60	
Hayes Center	.....	.....	.....	0.59	
Hay Springs	75	26	50.7	3.04	T.
Hebron	84	26	57.4	2.25	
Hickman	.....	.....	.....	2.70	
Holbrook	.....	.....	.....	0.50	T.
Holdrege	83	29	57.4	0.75	
Hooper *1	80	30	53.1	1.60	
Imperial	82	28	53.0	1.00	0.2
Johnstown	.....	.....	.....	1.52	
Kearney	85	29	55.1	1.30	
Kimball	75	27	49.6	0.63	T.
Kirkwood *1	80	28	49.6	2.00	T.
Laclede	81	29	55.8	2.56	
Lexington	82	22	54.2	1.55	
Lodgepole	83	25	51.2	0.25	T.
Loup	.....	.....	.....	3.96	
Lynch	82	24	54.2	0.90	
Lyons	.....	.....	.....	1.80	
McCook *1	82	30	57.2	0.60	
McCool	.....	.....	.....	3.02	
Madison	78	30	53.0	2.41	
Madrid	.....	.....	.....	0.26	
Marquette	.....	.....	.....	2.53	T.
Mason City	.....	.....	.....	2.04	
Minden *a*	83	30	56.0	1.34	
Monroe	.....	.....	.....	2.09	
Nebraska City *b* *1	84	38	58.1	5.80	
Nemaha *1	84	36	59.4	2.65	
Nesbit	81	27	51.1	0.75	T.
Norfolk	79	28	53.0	2.65	T.
North Loup	85	28	54.2	2.76	
Oakdale	80	27	52.6	1.78	
Odell	.....	.....	.....	3.57	
O'Neill	82	29	53.9	1.72	
Ord	.....	.....	.....	2.61	
Osceola	.....	.....	.....	0.86	
Ough	.....	.....	.....	1.20	
Palmer	.....	.....	.....	2.77	
Palmyra *1	86	30	55.5	2.83	
Plattsmouth *b*	.....	.....	.....	1.82	
Pleasanthill	.....	.....	.....	2.90	
Ravenna *a*	84	28	55.2	1.67	T.
Ravenna *b*	.....	.....	.....	1.41	
Redcloud *b*	80	20	54.6	1.60	
Republican *1	80	34	55.2	1.45	
Rulo	.....	.....	.....	1.25	
St. Libory	.....	.....	.....	1.91	
St. Paul	84	29	56.2	2.45	
Salem *1	82	36	56.9	1.42	
Santee	84	30	56.0	1.66	
Schuyler	.....	.....	.....	1.50	
Seward	.....	.....	.....	1.86	
Smithfield	.....	.....	.....	0.86	
Spragg	.....	.....	.....	1.37	
Springview	77	29	51.8	1.72	T.
Stanton	81	29	54.1	1.94	
State Farm	84	29	57.0	3.20	
Strang	.....	.....	.....	4.04	
Stratton	.....	.....	.....	0.57	
Superior	83	22	55.2	1.45	
Syracuse	.....	.....	.....	3.31	
Tablerock	.....	.....	.....	3.74	
Tecumseh *b*	87	20	56.8	2.05	
Tecumseh *c*	.....	.....	.....	2.54	
Tekamah	84	29	55.8	1.54	
Turlington	84	31	57.2	3.23	
Wakefield	82	26	53.3	2.31	
Wallace	.....	.....	.....	0.00	
Wauneta	.....	.....	.....	1.20	
Weeping Water	.....	.....	.....	2.07	
Westpoint	84	29	56.5	1.16	
Whitman	.....	.....	.....	0.66	T.
Wilber *1	82	30	55.8	2.80	
Willard	.....	.....	.....	1.10	
Wilsonville	.....	.....	.....	0.72	
Winnebago	.....	.....	.....	2.13	
Wisner	.....	.....	.....	2.74	T.
Wymore	.....	.....	.....	3.62	
York	83	31	57.8	1.35	
Nevada.					
Austin	70	28	49.2	1.79	
Battle Mountain *1	76	20	56.3	0.25	
Belmont	68	25	47.6	1.31	1.0
Beowawe *1	82	40	55.2	1.05	
Candelaria	90	30	58.0	1.07	T.
Carlin *1	82	25	47.8	0.00	
Carson City	82	26	52.5	0.72	T.
Cranes Ranch	.....	.....	.....	0.89	
Elko (near)	71	26	49.2	1.45	
Ely	73	22	47.2	1.53	T.
Fenelon *1	75	30	48.9	.....	
Golconda *5	78	45	60.5	0.01	
Halleck *1	70	26	46.7	0.00	
Hamilton	69	17	44.0	1.19	
Hawthorne	78	32	56.2	0.00	
Humboldt *1	80	38	54.9	1.70	
Lee	.....	.....	.....	2.07	
Lewers Ranch	78	29	53.4	2.22	0.5
Lovelocks *a* *1	82	35	53.9	1.10	
Lovelocks *b*	89	29	54.8	1.39	
Martins	83	26	53.0	0.66	
Mill City *1	83	32	56.2	0.75	
Monitor Mill	74	24	45.8	1.28	2.0
Owyhee	81	27	49.4	2.19	
Palisade *1	77	27	45.1	0.05	
Palmetto	80	25	50.2	1.87	4.0
Potts	70	28	46.6	0.61	4.0
Reno State University	80	31	53.2	0.51	T
Silverpeak *f*	76	32	54.6	.....	
Sodaville	84	41	62.9	0.24	
Tecoma *1	80	45	61.2	2.00	
Toano *5	73	35	53.0	1.42	
Tybo	73	27	50.7	1.70	6.0
Verdi *5	83	37	59.9	0.75	
Wadsworth *1	80	28	60.6	0.40	
Wells *1	70	31	47.4	0.91	
Woods	72	24	46.4	1.21	
New Hampshire.					
Alstead	69	24	47.8	2.92	T.
Berlin Mills	77	17	46.9	3.10	1.0
Bethlehem	69	24	45.8	3.83	0.5
Brookline *1	76	20	50.5	4.07	T.
Chatham	78	23	47.4	3.35	
Concord	74	19	48.2	3.61	
Durham	76	31	52.2	3.21	
Franklin Falls	72	22	48.0	4.07	T.
Grafton	73	15	45.7	2.92	T.
Hanover	74	19	48.5	1.77	T.
Keene	75	19	48.6	4.36	T.
Nashua	77	22	50.7	3.13	
Newton	75	21	50.0	2.90	
Peterboro	76	16	48.9	3.74	
Plymouth	72	19	46.0	1.37	T.
Sanbornton	73	24	47.6	3.82	T.
Stratford	73	19	46.9	2.47	2.0
New Jersey.					
Asbury Park	79	33	56.2	1.56	
Bayonne	79	35	56.1	1.93	
Belvidere	79	26	53.3	1.57	
Bergen Point	75	35	54.4	2.08	
Beverly	81	29	55.8	1.66	T.
Blairstown	80	24	52.0	1.53	
Bridgeton	82	30	56.4	1.80	
Camden	79	34	55.5	1.58	
Cape May C. H.	79	30	56.6	0.96	
Charlotteburg	72	28	51.0	1.66	
Chester	75	30	52 0	3.15	
Clayton	79	30	55.0	2.46	
College Farm	78	28	54.6	1.89	
Dover	75	26	51.9	2.07	
Egg Harbor City	78	28	54.2	1.75	
Elizabeth	77	31	54.0	2.43	
Englewood	76	39	55.4	2.39	
Flemington	78	27	54.4	1.58	
Freehold	76	32	53.2	2.65	
Friesburg	79	28	55.4	2.52	
Hanover	76	26	51.6	2.45	
Hightstown	78	32	54.6	2.20	
Imlaystown	78	31	56.4	2.07	
Indian Mills	82	28	55.6	1.59	
Lakewood	79	29	54.7	1.69	
Lambertville	78	28	54.4	1.43	
Layton	75	21	49.1	1.35	
Moorestown	80	31	55.8	2.50	
Mount Pleasant	.....	.....	.....	1.18	
Newark	77	34	54.3	2.14	
New Brunswick	77	29	55.4	1.69	
New Egypt	.....	.....	.....	1.95	
Newton	78	27	52.4	1.85	
Oceanic	77	32	55.0	1.94	
Paterson	79	32	56.2	3.19	
Perth Amboy	76	35	55.1	2.06	
Plainfield	76	26	52.7	1.70	
Rancocas	.....	.....	.....	2.02	
Rivervale	78	26	52.2	4.45	
Roseland	77	27	52.4	1.93	
Salem	81	30	56.6	2.30	
Somerville	78	26	53.6	1.73	
South Orange	75	33	53.1	2.08	
Sussex	76	28	52.2	2.81	
Three Bridges	.....	.....	.....	1.25	
Toms River	81	25	52.6	1.80	
Trenton	77	35	56.9	1.44	
Tuckerton	81	27	55.2	1.53	
Vineland	79	29	55.8	1.71	
Woodbine	78	28	54.9	1.31	
Woodstown	.....	.....	.....	1.89	
New Mexico.					
Alamagordo	98	41	61.4	2.59	
Albert	85	33	59.6	1.03	
Albuquerque	81	36	57.6	2.00	
Alma	86	34	57.4	1.68	
Aztec	85	28	53.4	0.67	
Bellranch	.....	.....	.....	0.78	
Bluewater	80	22	49.6	0.40	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
New Mexico—Cont'd.	°	°	°	*Ins.*	*Ins.*
Cambray	.....	.....	.....	2.95	
Carlsbad	99	38	66.6	2.94	
Deming	.....	.....	.....	0.75	
East Lasvegas	71	33	51.8	1.40	
Engle	87	37	61.0	2.17	
Folsom	76	24	50.4	0.29	
Fort Bayard	83	32	56.8	2.57	T.
Fort Stanton	80[d]	26[d]	52.9[d]	1.76	
Fort Union	80	25	52.4	2.30	
Fort Wingate	87	24[e]	53.8	0.92	
Gage	.....	.....	.....	1.45	
Gallisteo	78	31	53.0	1.85	
Gallinas Spring	80	31	55.2	0.93	
Horse Springs	80	29	51.4	2.98	
Las Vegas	77	27	51.8	1.46	
Las Vegas Hotsprings	76	27	52.2	1.35	
Mesilla Park	91	34	60.8	2.85	
Raton	78	25	52.6	0.00	
Roswell	91	31	60.6	2.21	
San Marcial	90	35	61.2	0.10	
Socorro	85	35	59.1	1.39	
Springer	86	26	54.3	0.89	
Strauss	.....	.....	.....	3.15	
Woodbury	82	30	55.2	1.32	
New York.					
Adams	.....	.....	.....	4.71	T.
Addison	77	24	49.6	0.93	
Adirondack Lodge	72	22	44.6	3.33	3.5
Akron	.....	.....	.....	1.44	
Alden	74	26	50.4	1.62	T.
Alfred	76	24	48.3	1.14	T.
Angelica	74	20	46.9	1.15	T.
Appleton	79	27	51.6	0.84	
Atlanta	77	22	48.8	1.31	
Auburn	75	28	52.2	1.84	0.5
Avon	74	22	48.6	2.16	
Baldwinsville	74	29	51.6	2.87	2.0
Bedford *a*	78	26	52.6	3.57	
Blue Mountain Lake	.....	.....	.....	3.00	T.
Bolivar	74	20	47.0	1.37	T.
Bouckville	69	24	48.6	2.38	7.5
Boyds Corners	.....	.....	.....	3.30	
Brockport	73	29	50.6	1.74	
Caldwell	74	25	49.2	1.93	T.
Canaan Four Corners	72	26	48.6	2.29	T.
Canajoharie	.....	.....	.....	2.97	
Canton	.....	.....	.....	3.70	
Carmel	75	30	52.2	4.15	
Carvers Falls	76	20	49.0	1.17	
Catskill	79	28	52.4	1.00	
Cedarhill	77	25	51.6	1.94	
Chenango Forks	.....	.....	.....	2.25	
Cherry Creek	.....	.....	.....	1.62	T.
Cooperstown	70	25	47.5	2.48	2.0
Cortland	.....	.....	.....	1.02	
Cutchogue	76	32	54.9	1.77	
Dekalb Junction	.....	.....	.....	2.72	T.
Easton	.....	.....	.....	2.59	
Elba	76	26	50.8	1.68	T.
Elmira	76	30	51.8	0.93	
Fayetteville	77	26	51.8	2.25	4.0
Franklinville	75	20	46.8	1.32	T.
Fulton	.....	.....	.....	1.96	
Gabriels	72	21	45.2	2.83	2.5
Glens Falls	75	25	50.1	1.05	
Gloversville	72	24	47.2	1.08	T.
Greenwich	73	26	49.6	2.25	
Griffin Corners	77	20	47.6	2.36	T.
Haskinville	.....	.....	.....	1.08	
Hemlock	71	30	50.4	1.22	
Honeymead Brook	73	25	49.6	2.06	T.
Honnedaga Lake	.....	.....	.....	3.78	
Humphrey	74	22	47.2	1.77	1.6
Indian Lake	68[i]	19[i]	45.4[i]	2.99	T.
Ithaca	75	28	51.2	1.07	T.
Jamestown	78	24	49.0	1.57	T.
Jay	78	18	49.2	2.23	
Keene Valley	72	20	47.4	3.16	T.
King Ferry	.....	.....	.....	0.89	
King Station	.....	.....	.....	1.90	
Littlefalls, City Res	70	26	48.7	1.55	T.
Lockport	76	34	54.4	2.35	T.
Lowville	70	24	47.4	2.47	
Lyndonville	.....	.....	.....	0.59	
Lyons	76[e]	30[e]	53.1[f]	1.95	T.
Mayle	.....	.....	.....	1.69	
Meredith	70	19	46.3	2.37	1.0
Middletown	74	32	53.1	1.70	T.
Mohonk Lake	71	28	49.6	1.62	T.
Moira	78	23	49.2	2.91	
Newark Valley	.....	.....	.....	1.30	
New Lisbon	72	17	45.2	1.54	1.2
New Rochelle	79	25	52.0	1.61	
North Hammond	72	28	49.8	2.29	1.0
North Lake	69	21	45.2	2.97	
Number Four	69	20	45.2	3.99	3.1
New York—Cont'd.	°	°	°	*Ins.*	*Ins.*
Ogdensburg	72	25	49.2	2.01	
Old Chatham	.....	.....	.....	1.30	
Oneonta	78	23	49.0	2.64	T.
Oxford	75	21	48.4	3.04	T.
Palermo	.....	.....	.....	2.80	
Penn Yan	75	31	51.8	1.22	T.
Perry City	73	21	47.7	0.86	
Plattsburg Barracks	78	26	49.4	2.00	T.
Port Byron	72	27	50.2	1.99	T.
Port Jervis	76	27	52.2	1.44	
Primrose	76	26	51.8	2.94	
Redhook	.....	.....	.....	1.30	T.
Richmondville	75	25	50.7	2.19	T.
Ridgeway	75	29	51.7	1.66	1.0
Rome	68	25	46.6	2.38	T.
Romulus	78	29	50.6	0.59	
Salisbury Mills	.....	.....	.....	2.15	
Saranac Lake (near)	73	18	46.2	3.09	0.3
Saratoga Springs	75	25	51.2	1.10	T.
Schenectady	74	23	49.4	1.25	
Scottsville	.....	.....	.....	1.37	
Setauket	73	34	54.8	2.76	
Shortsville	74	29	51.1	1.11	
Skaneateles	.....	.....	.....	2.56	
Southampton	72	30	53.8	2.47	
South Canisteo	73	24	48.6	0.62	T.
Southeast Reservoir	.....	.....	.....	5.24	
South Kortright	73	20	46.8	3.87	0.2
South Schroon	71	20	46.6	2.31	0.2
Straits Corners	75[e]	23[e]	48.0[e]	1.13	T.
Ticonderoga	74	28	51.8	2.03	
Volusia	72	31	49.3	2.35	T.
Walton	75	20	48.2	2.05	T.
Wappingers Falls	76	27	52.0	2.42	
Warwick	.....	.....	.....	2.56	
Watertown	73	23	50.2	3.23	
Waverly	78	23	50.4	1.42	
Wedgwood	73	28	49.6	0.81	
Wells	.....	.....	.....	2.04	
West Berne	76	21	50.0	2.50	
West Chazy	71	23	47.6	.....	
Westfield *a*	.....	.....	.....	1.71	
Westfield *b*	74	32	50.8	1.92	
Westfield *c*	78	31	53.0	1.96	
Windham	73	22	49.2	1.98	T.
North Carolina.					
Asheville	.....	.....	.....	1.04	
Biltmore	75	35	53.9	0.87	
Bryson City	.....	.....	.....	0.80	
Chapelhill	84	34	60.2	2.13	
Cherryville	83	33	59.0	0.72	
Currituck	.....	.....	.....	1.02	
Edenton	82	36	60.5	2.80	
Fayetteville	86	34	62.6	1.21	
Flatrock	80	26	53.8	2.72	
Goldsboro	83	36	60.0	1.96	
Greensboro	82	37	58.0	0.86	
Henderson	84	36	59.4	3.40	
Hendersonville	80	29	55.7	2.90	
Henrietta	88	34	59.8	1.18	
Highlands	74	25	51.6	3.62	
Horse Cove	75	33	55.4	2.92	
Kinston	85	32	62.0	0.94	
Lenoir	84	31	56.5	0.90	
Linville	69	24	47.5	2.07	
Littleton	83	33	58.4	2.06	
Louisburg	81	34	59.2	3.01	
Lumberton	82	36	60.3	1.21	
Marion	84	34	58.2	1.59	
Mocksville	84	29	58.2	1.01	
Moncure	80	35	59.6	1.01	
Monroe	84	27	58.0	2.16	
Morganton	83	30	57.3	0.90	
Mountairy	81	31	56.6	1.00	
Murphy	.....	.....	.....	0.55	
Newbern	84	36	63.8	1.74	
Oakridge	87	30	59.6	0.34	
Patterson *k*	90	32	52.4	1.03	
Pittsboro	86	31	58.4	1.99	
Redsprings	85	33	61.2	0.46	
Rockingham	89	31	59.1	0.43	
Roxboro	83[j]	34[j]	57.8[j]	1.31	
Salem	83	31	57.0	0.80	
Salisbury	88[e]	31[e]	60.4[e]	T.	
Saxon	80	30	55.7	1.25	
Selma	86	33	60.6	2.04	
Settle	83	35	59.6	1.00	
Sloan	86	32	62.2	1.57	
Soapstone Mount	80	28	52.4	1.05	
Southern Pines *a*	89	35	64.8	0.46	
Southern Pines *b*	84	35	62.1	0.37	
Southport	85	45	65.9	3.80	
Springhope *k*	86	37	59.8	1.50	
Tarboro	90[b]	33[b]	63.6[b]	3.51	
Washington	85	38	64.0	2.90	
Waynesville	78	26	51.4	0.52	
North Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
Weldon *a*	79	37	58.4	3.21	
Weldon *b*	.....	.....	.....	3.11	
North Dakota.					
Amenia	83	23	48.6	2.53	
Ashley	79	13	46.6	2.05	
Berlin	85	20	47.8	2.52	0.1
Buxton	80	22	47.6	2.25	
Coalharbor	81	21	48.4	0.24	T.
Devils Lake	81	24	48.2	1.50	
Dickinson	81	23	48.2	0.22	T.
Donnybrook	.....	.....	.....	0.22	
Dunseith	79	13	45.2	0.69	
Edgeley	86	20	50.6	2.65	0.1
Ellendale	82	23	49.4	2.20	
Fargo	81	23	47.4	3.83	
Forman	80	23	49.5	3.22	
Fort Yates	85	24	51.5	1.06	
Fullerton	81	23	47.8	2.81	0.5
Gallatin	78	13	44.2	2.11	
Grafton	79	20	46.2	0.90	
Hamilton	79[b]	22[b]	47.6[b]	0.92	
Hannaford	82	21	47.0	2.26	
Jamestown	83	23	48.5	2.11	
Larimore	81	18	45.7	1.73	
McKinney	80	19	46.6	0.10	
Mayville	82	22	47.8	2.18	
Medora	81	22	49.2	0.10	
Melville	78[e]	22[e]	48.2[e]	2.03	
Milton	76	17	43.4	0.55	
Minto	81[e]	16	44.9[e]	1.24	
Napoleon	80	20	48.4	2.60	
New England	80	21	47.9	0.18	
Oakdale	76	23	49.1	0.23	0.5
Pembina	77	18	43.4	0.95	
Portal	.....	17	.....	0.41	
Power	81	24	49.7	3.24	
Steele	78	23	47.0	1.69	
University	88	22	46.4	2.21	
Wahpeton	80	28	50.8	3.53	
Willow City	82	19	45.5	T.	
Woodbridge	77	17	43.4	0.35	T.
Ohio.					
Akron	75	25	52.2	0.72	T.
Atwater	.....	.....	.....	0.53	
Bangorville	81	23	54.2	0.60	T.
Bellefontaine	76	28	52.7	1.33	
Bement	.....	.....	.....	0.63	T.
Bethany	81	32	58.1	0.93	
Binola	.....	.....	.....	0.70	
Bloomingburg	80	28	54.6	0.31	T.
Bowling Green	81	24	53.4	1.15	
Cambridge	83	24	52.6	T.	
Camp Dennison	83	26	54.8	0.84	
Canaan	.....	.....	.....	0.67	
Canal Dover	80	25	52.0	0.30	
Canton	78	30	52.0	0.51	T.
Cardington	80	22	52.4	0.43	
Cedarville	.....	.....	.....	0.48	
Celina	81[d]	23[d]	55.0[d]	0.94	
Circleville	83	27	55.6	0.41	
Clarksville	82	26	56.8	0.73	
Cleveland *a*	76	34	54.2	0.92	
Cleveland *b*	78	33	53.2	0.87	0.1
Clifton	83	26	56.0	0.71	
Coalton	84	20	54.3	0.36	
Colebrook	75	25	48.5	0.28	
Dayton *a*	.....	.....	.....	0.83	
Dayton *b*	82	26	54.8	1.12	
Defiance	82	24	54.8	2.63	
Delaware	80	24	53.0	0.74	
Elyria	80	29	53.0	0.73	
Findlay	84	26	55.6	0.86	
Frankfort	83	25	54.0	0.50	
Fremont	80	28	54.2	1.01	T.
Garrettsville	78	24	51.0	0.81	T.
Granville	81	25	54.4	0.38	
Gratiot	79	26	53.3	0.31	
Green	79	28	54.6	0.25	
Greenfield	80	30	54.9	0.12	
Greenhill	78	23	50.0	0.37	
Greenville	77	29	54.6	1.08	
Hanging Rock	83	27	56.8	0.28	
Hedges	81	24	54.2	2.27	
Hillhouse	77	22	51.0	1.75	
Hillsboro	79	23	53.4	0.47	
Hiram	76	30	52.3	0.77	T.
Hudson	77	26	52.0	0.64	
Jacksonboro	83	32	57.6	1.50	
Killbuck	78	26	52.0	0.17	T.
Lancaster	81	27	54.4	0.35	
Delpsic	.....	.....	.....	1.22	
Lima	88	25	55.7	0.88	
McConnelsville	84	25	53.7	0.27	
Manara	81	26	54.4	0.51	
Mansfield	.....	.....	.....	0.83	T.
Marietta	81	32	55.1	0.06	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.	°	°	°	*Ins.*	*Ins.*
Marion	81	25	54.8	0.97	
Medina	81	28	53.5	0.59	T.
Milfordton	79	25	51.7	0.48	
Milligan	84	21	53.0	0.10	
Millport	78	23	51.0	0.35	T.
Montpelier	80	23	52.4	4.09	
Moorefield	79	23	51.0	0.25	
Napoleon	84	26	55.6	1.73	
New Alexandria	78	30	53.4	0.20	T.
New Berlin	78	27	52.2	0.64	
New Bremen	80	25	55.0	1.09	
New Lexington				0.34	
New Paris	79	28	55.1	1.47	
New Richmond	83	30	58.2	0.60	
New Waterford	77	26	51.0	0.29	T.
North Lewisburg	78	26	53.6	0.90	
North Royalton	79	29	53.1	0.52	
Norwalk	83	25	55.2	0.58	
Oberlin	81	26	53.6	0.45	
Ohio State University	81	24	53.2	0.33	
Orangeville	77	21	49.6	0.30	T.
Ottawa	82	24	55.0	0.59	T.
Pataskala	79	25	53.2	0.56	
Philo	81	28	56.0	0.13	
Plattsburg	80	25	54.3	0.38	
Pomeroy	83	26	54.8	0.13	
Portsmouth *a*				0.25	
Portsmouth *b*	82	32	57.6	0.25	
Pulse				0.74	
Red Lion				0.75	
Richfield				0.63	T.
Richwood	81	23	52.2	0.51	
Ripley	81	28	56.6	0.96	
Rittman	77	27	51.2	0.92	T.
Rock				0.45	
Rockyridge	83	26	54.6	0.97	T.
Shenandoah	87	22	51.8	0.38	
Sidney	82	24	53.6	1.73	
Somerset	80	27	56.0	0.42	
Springfield				0.58	
Strongsville				0.47	
Swanton				1.36	T.
Thurman	85	28	54.8	T.	
Tiffin	76	28	53.5	0.84	T.
Upper Sandusky	82	26	55.4	0.41	
Urbana	77	31	55.3	0.90	
Vanwert	80	25	54.0	2.24	T.
Vermillion	81	29	54.0	0.74	T.
Vickery	83	26	53.9	0.75	
Walnut				0.36	
Warren	79	26	51.6	0.67	
Warsaw	81	23	51.2	0.58	
Wauseon	82	24	53.4	2.88	T.
Waverly	83	26	55.9	0.42	
Waynesville	80	26	54.8	0.80	
Wellington	81	27	53.3	0.32	
Westerville	82	23	52.1	0.58	
Willoughby				1.49	
Wooster	79	26	51.8	0.79	T.
Zanesville				0.25	
Oklahoma.					
Arapaho	92	32	65.9	0.28	
Beaver	86	34	59.9	0.97	
Blackburn	94	27	64.8	2.80	
Burnett	94	30	66.4	1.09	
Chandler	96	33	65.7	1.15	
Clifton	95	30	66.0	3.50	
Fort Reno	95	34	65.8	1.75	
Fort Sill	92	34	67.6	0.30	
Guthrie	92	38	66.3	1.60	
Hennessey	96	33	66.6	2.22	
Jenkins	91	32	63.2	2.28	
Kenton	89	29	58.7	0.61	
Kingfisher	96	33	66.8	2.60	
Lyons	91	31	64.2	2.45	
Mangum	93	45	68.2	1.70	
Newkirk	90	33	65.8	1.60	
Norman	93	30	66.3	0.76	
Pawhuska	91	30	64.0	1.60	
Perry	94	34	65.6	1.93	
Pearch	93	32	62.6	1.53	
Sac and Fox Agency	91	29	64.5	2.83	
Shawnee	95	34	66.8	1.24	
Stillwater	94	32	66.3	2.11	
Taloga	93	29	62.7	1.58	
Waukomis	96	30	66.0	1.70	
Weatherford	91	37	64.4	2.03	
Woodward	92	37	65.4	2.05	
Oregon.					
Albany *a* [1]	82	45	59.6	0.83	
Albany *b*				1.10	
Alpha	83	36	58.0	3.76	
Ashland *b*	85	36	56.7	0.96	
Aurora [1]	83	45	58.0	0.67	
Aurora (near)	78	41	56.8	1.31	
Bay City	83	41	56.3	5.75	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Oregon—Cont'd.	°	°	°	*Ins.*	*Ins.*
Bend	79	26	51.4		
Beulah	89	19	51.4	0.61	
Blackbutte	76	39	56.4	2.31	
Blalock	79	43	61.0	T.	
Brownsville [1]	86	44	58.6	0.58	
Bullrun	67	42	54.3	2.23	
Burns	81	21	51.2	0.07	
Cascade Locks	78	46	62.0	1.96	
Comstock [1]	80	45	57.8	1.88	
Coquille				2.03	
Corvallis	82	40	57.4	2.23	
Dayville	83	31 [d]	55.4	0.46	
Ella				0.06	
Eugene	78	43	57.4	1.44	
Fairview	85 [e]	40 [e]	56.6 [e]	3.34 [e]	
Falls City	71	40	54.2	3.00	
Forestgrove	82	38	58.2	1.35	
Gardiner	85	41	58.2	4.63	
Glenora	74	32	54.0	4.78	
Government Camp	87	32	52.6	2.59	
Grants Pass	84	34	57.9	1.33	
Hare	89			4.38	
Heppner	80	32	57.0	0.12	
Hood River (near)	81	38	58.4	0.12	
Huntington	88	27	57.8	0.13	
Jacksonville	85	37	57.5	1.46	
Joseph	75	28	44.6	0.18	
Junction City [1]	82	42	59.4	0.57	
Kerby	84	37	57.4	2.22	
Klamath Falls	72	29	51.9	0.90	
Lafayette [1]	83	45	59.4	0.74	
Lagrande	80	34	55.4	0.88	
Lakeview	80	26	52.6	1.29	T.
Lonerock	79	24	54.6	0.13	
McMinnville	80	39	57.6	1.40	
Merlin [1]	85	38	57.1	0.58	
Monroe	79	41	57.6	1.29	
Mount Angel	81	43	58.0	1.65	
Nehalem				6.20	
Newberg	81	40	58.6	1.62	
Newbridge	83	29	53.4	0.15	
Newport	82	44	57.0	5.53	
Pendleton	82	34	53.3	0.54	
Placer				2.28	
Prineville	79	22	50.2	0.05	
Riddles [1]	90	45	59.5	2.10	
Riverside	81	26	53.5	0.42	
Salem *b*	89	44	59.6	1.25	
Shaniko	75	30	51.7	0.40	
Sheridan [1]	80	47	58.6	1.23	
Silverlake	84	24	51.4	1.31	
Silverton [1]	78	50	57.7	1.17	
Siskiyou [1]	80	38	57.6	1.92	0.5
Sparta	75	32	53.7	1.07	
Springfield [1]	74	43	57.0	1.35	
Stafford	80	42	58.8	1.41	
The Dalles	77	37	58.2	0.13	
Tillamook				3.17	
Toledo	92	40	58.1	4.69	
Umatilla				T.	
Vale	86	18	53.6	0.45	
Weston	76	33	54.2	0.67	
Williams	80	32	54.6	1.64	
Pennsylvania.					
Aleppo	80	24	54.4	0.54	
Altoona	77	26	50.7	0.59	
Athens	79	24	50.8	1.48	
Beaver Dam				0.25	
Bellefonte	78	27	53.1	0.24	
Bethlehem				2.36	
Brookville				1.08	
Browers Lock				1.33	
Butler	75	26	50.4	0.69	T.
Cassandra	73	27	50.2	0.70	T.
Centerhall	79	30	53.0	0.71	
Coatesville	81	29	54.8	1.73	
Confluence				0.85	
Davis Island Dam				0.52	
Doylestown				0.96	
Driftwood				1.21	
Duncannon				2.12	
Dushore	73	22	47.9	2.71	
Dyberry	72	21	47.1	1.28	
East Bloomsburg				2.56	
East Mauch Chunk	77	24	51.2	2.00	
Easton	74	30	52.9	1.19	
Ellwood Junction				0.23	
Emporium	75	26	50.2	1.23	T.
Ephrata	79	29	55.0	1.25	
Everett	77	25	50.8 [d]	0.35	T.
Forks of Neshaminy [1]	88 [c]	30 [b]	50.4 [c]	1.38	
Franklin	80	29	51.6	0.63	
Freeport				0.64	
Girardville				2.81	T.
Grampian	76	20	47.3	0.26	
Greensboro				0.27	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.	
Pennsylvania—Cont'd.	°	°	°	*Ins.*	*Ins.*	
Hamburg				1.75		
Hamlinton	79	27	49.3	2.15		
Hawthorn	82	26 [k]	52.6 [f]	2.36	T.	
Herrs Island Dam				0.33		
Huntingdon *a*	80	25	53.4	0.76		
Huntingdon *b*				1.50		
Irwin				0.77		
Johnstown	81	28	54.0	0.73		
Keating				0.72		
Kennett Square	80	29	55.2	1.28		
Lancaster	80	29	54.6	1.33		
Lansdale				1.42		
Lawrenceville	78	32	48.4	1.54		
Lebanon	79	28	53.4	1.40	T.	
Leroy	75	28	50.2	1.16	0.2	
Lewisburg	77	27	52.2	1.16		
Lockhaven *a*	82	26	54.0	1.25		
Lockhaven *b*				1.37		
Lock No. 4				0.77		
Lycippus		28		0.48		
Mifflin				1.15		
Oil City				0.39		
Ottsville				1.57		
Parker				0.75		
Philadelphia	80	38	57.1	1.72	T.	
Pocono Lake	69	22	48.3	3.35		
Point Pleasant				1.16		
Pottstown	78	29	54.7	2.20		
Pottsville				1.94		
Quakertown	76	26	53.6	1.73	T.	
Reading [2]			51.2	1.50		
Renovo *a*				0.78		
Renovo *b*	79	28	52.0	0.75		
Saegerstown	75	22	49.7	1.28	T.	
St. Marys	73	26	48.4	1.45		
Seisholtzville				2.07		
Selinsgrove	79	28	52.6	1.34		
Shawmont				1.29		
Smethport	74	24	48.2	1.10	2.0	
Smiths Corners				1.33		
Somerset		20		0.90	T.	
South Eaton	76	26	51.2	1.94		
Springmount				1.65		
State College	76	28	51.3	0.40	0.1	
Sunbury				1.05		
Swarthmore	78 [c]	32 [c]	53.8 [c]	1.02		
Towanda	77	24	50.1	1.31		
Troutrun				2.24		
Uniontown	76	32	54.6	0.46		
Warren	72	26	48.6	1.29	1.0	
Wellsboro	74	24	50.6	0.39	T	
Westchester	78	33	55.0	1.92		
West Newton				0.47		
Westtown	77	28	53.8	1.28		
Wilkesbarre	77	27	51.2	2.55		
Williamsport	79	31	51.4	1.59		
York	81	28	54.7	1.59		
Rhode Island.						
Bristol	70	35	54.4	2.64		
Kingston	74	27	52.0	2.93		
Pawtucket	78	29	54.6	3.13		
Providence *a*	74	35	54.5	2.98		
Providence *c*	76	34	53.4	3.08		
South Carolina.						
Allendale	87	39	66.1	0.62		
Anderson	87	40	64.2	0.98		
Barksdale	83	38	62.4	0.77		
Batesburg	85	43	62.2	1.50		
Beaufort	86	43	67.8	0.50		
Blackville	90	35	64.2	0.78		
Bowman	89	33	63.2	1.32		
Calhoun Falls				1.14		
Camden				0.45		
Cheraw *a*	84	34	60.8	0.18		
Cheraw *b*				0.25		
Clemson College	86	34	60.3	0.30		
Conway	87	35	64.0	1.10		
Darlington	89	33	62.9	0.33		
Due West	82	41	61.4	0.73		
Edisto				1.30		
Effingham				1.42		
Florence	85	38	62.0	0.88		
Gaffney	86	34	61.2	1.02		
Georgetown	83	43	63.4	T.		
Gillisonville	89	32	63.0	0.71		
Greenville	81	36	60.8	0.82		
Greenwood	86	37	62.5	1.32		
Kingstree *a*	83	36	60.8	0.85		
Kingstree *b*				1.21		
Liberty	85	35	58.8	0.69		
Little Mountain	86	42	62.2	1.73		
Longshore	86	36	62.3	1.37		
Pinopolis [1]	79	40	62.2	0.86		
St. Georges	85	37	62.5	0.42		
St. Matthews	86	36	62.8	0.66		
St. Stephens				0.57		

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
South Carolina—Cont'd.	°	°	°	*Ins.*	*Ins.*
Santuck	85	31	59.4	0.92	
Seivern	92	29	61.2	0.61	
Smiths Mills	.....	.....	.....	2.70	
Society Hill	82	36	61.5	0.20	
Spartanburg	85	36	60.6	1.01	
Statesburg	87	41	64.1	0.56	
Summerville	85	36	63.1	1.03	
Temperance	89	33	61.8	0.62	
Trenton	84	47	64.6	2.86	
Trial	84	30	61.2	0.46	
Walhalla	82	34	58.2	0.55	
Winnsboro	85	40	62.5	1.35	
Winthrop College	84	36	61.3	0.58	
Yemassee	87	35	63.8	0.89	
Yorkville	86	42	63.4	0.69	
South Dakota.					
Aberdeen	83	24	47.4	1.54	
Academy	80	29	54.0	2.70	
Alexandria	83	29	52.7	1.21	
Armour	84	28	51.9	2.12	
Ashcroft	87	15	50.7	.....	
Bad Nation	84[e]	25[e]	52.2[e]	1.92	
Bowdle	81	24	49.4	2.07	
Brookings	81	23	48.8	0.74	0.6
Canton	83	25	53.0	1.42	
Centerville	.....	.....	.....	1.52	T.
Chamberlain	84	20	53.5	2.56	T.
Clark	82	23	50.3	1.55	T.
Desmet	76	27	50.4	1.62	
Doland	77	24	51.4	1.42	
Elkpoint	87	27	55.2	1.70	T.
Farmingdale	.....	.....	.....	1.90	T.
Faulkton	80	26	50.7	1.75	
Fiandreau	82	25	50.5	1.94	T.
Forestburg	83	27	52.8	0.87	
Fort Meade	80	28	51.6	0.83	T.
Gannvalley	81	28	52.5	2.57	
Grand River School	85	25	50.8	0.69	
Greenwood	85	30	56.0	1.76	
Hartman	80	27	51.5	1.31	
Hitchcock	.....	.....	.....	2.34	
Hotch City	84	25	53.4	2.12	T.
Howard	82	.....	.....	0.95	
Interior	78	27	54.4	2.23	
Ipswich	82	24	49.0	2.35	T.
Kimball	78	31	52.6	1.61	
Leola	89	21	50.6	2.00	0.5
Leslie	84	25	53.2	0.49	
Marion	88	28	53.5	2.29	T.
Mellette	82	27	51.3	2.47	
Menno	81	29	52.4	1.62	
Millbank	85	22	53.1	1.37	
Mitchell	83	30	53.4	2.35	
Mound City	82	21	50.3	1.64	
Oelrichs	78	25	49.8	4.70	
Pine Ridge	82	.....	.....	2.63	
Plankinton	84	29	51.1	1.64	T.
Redfield	81	25	49.4	2.39	
Rochford	76	19	44.8	1.09	3.2
Rosebud	81	26	50.8	1.07	
St. Lawrence	84	20	54.2	2.31	
Silver City	.....	.....	.....	0.84	T.
Sioux Falls	84	30	53.6	1.44	
Sisseton Agency	78	25	50.5	1.77	T.
Spearfish	77	32	53.3	1.45	
Vermillion	85	31	55.3	1.42	
Waubay	74	23	47.7	1.77	
Wentworth	82	28	50.9	1.17	
Wolsey	.....	.....	.....	1.63	
Tennessee.					
Andersonville	82	32	57.5	0.90	
Arlington	85	55	60.7	1.21	
Ashwood	84	33	59.0	0.95	
Benton	83	31	58.9	1.62	
Bluff City	.....	.....	.....	1.98	
Bolivar	83	35	59.6	0.85	
Bristol	82	29	54.4	2.30	
Brownsville	84	38	60.0	1.80	
Byrdstown	81	31	57.6	1.36	
Carthage	87	33	60.0	1.09	
Clarksville	80	36	59.5	1.31	
Clinton	.....	.....	.....	0.84	
Covington	84	38	61.2	1.57	
Decatur	85	31	58.6	0.63	
Dickson	84[e]	33[e]	59.7[e]	1.13	
Dover	84	32	59.2	2.23	
Dyersburg	92	35	60.2	3.55	
Elizabethton	87	26	55.4	2.05	
Erasmus	81	27	54.7	1.28	
Florence	81	34	58.5	0.61	
Franklin	88	34	57.8	0.84	
Grace[e1]	78	34	58.1	2.00	
Greeneville	82	28	55.8	1.99	
Harriman	83	32	57.4	0.57	
Hohenwald	83	29	57.2	1.07	
Iron City	85	34	60.0	1.22	
Johnsonville	87	30	60.5	1.61	
Jonesboro[e1]	79	33	52.4	2.07	
Kingston	.....	.....	.....	0.47	
Lafayette[e5]	82	31	57.0	0.60	
Lewisburg	86	33	59.4	1.14	
Liberty	84[e]	32[e]	58.9[e]	2.28	
Lynnville	82	35	58.7	1.52	
Maryville	84	33	58.6	2.60	
Milan	86	37	61.0	1.55	
Newport	80	33	56.8	1.40	
Oakhill	80	29	56.4	1.40	
Palmetto	83	35	60.5	1.53	
Peryear[e5]	82	40	61.4	0.80	
Pope	85	32	59.0	1.90	
Rogersville	78	31	56.4	1.48	
Rugby	81	25	55.0	0.90	
Savannah	84	35	60.8	1.53	
Sewanee	78	35	55.5	1.73	
Silverlake	73	29	50.8	3.30	
Springdale	84	28	55.7	0.63	
Tazewell	.....	.....	.....	0.67	
Tellico Plains	84	32	58.7	1.55	
Tracy City	79	30	55.6	1.76	
Trenton	.....	.....	.....	2.23	
Tullahoma	80	31	56.9	1.45	
Union City	86	35	60.8	2.46	
Waynesboro	80	31	57.6	1.40	
Wildersville	80	35	59.2	1.75	
Yukon	81	36	60.1	2.24	
Texas.					
Alvin	.....	.....	.....	5.99	
Anna	.....	.....	.....	0.64	
Arthur	.....	.....	.....	1.21	
Austin *a*	92	42	70.0	1.80	
Austin *b*[e5]	93	41	69.4	.....	
Ballinger	92	42	68.9	1.54	
Bastrop	94	44	72.2	0.75	
Beaumont	92	42	69.0	2.18	
Beeville	98	36	71.5	0.29	
Big Spring	.....	.....	.....	0.58	
Bianco	94	35	68.5	0.10	
Boerne[e1]	93	45	70.0	0.74	
Booth	.....	.....	.....	2.96	
Bowie	94	43	69.6	1.58	
Brazoria	84[d]	47[d]	70.2[d]	4.38	
Brenham	94	47	70.7	1.11	
Brighton	93	51	75.4	0.03	
Burnet	96	39	68.6	1.07	
Camp Eagle Pass	100	46	74.3	T.	
Coleman	96[1]	52[b]	70.8[1]	1.30	
College Station	98	36	66.4	1.05	
Columbia	87	42	68.0	2.90	
Comanche	93	44	68.5	1.10	
Corsicana	95	41	66.6	1.58	
Cuero	96	55	74.1	3.78	
Dallas	90	40	68.3	2.49	
Danevang	90	43	70.3	0.98	
Dublin	93	41	68.5	1.45	
Duval	92	49	70.5	1.19	
Estelle	92	41	69.6	2.12	
Fort Brown	91	53	73.8	1.90	
Fort Clark	98	50	72.5	0.00	
Fort McIntosh	101	52	78.6	0.00	
Fort Ringgold	99	60	82.5	0.09	
Fort Stockton	.....	.....	.....	3.00	
Fredericksburg	90	37	68.4	0.17	
Gainesville	94	36	68.1	1.83	
Grapevine	93[c]	40[c]	70.0[c]	1.11	
Hale Center	88	43	64.7	0.50	
Hallettsville	93	45	71.6	5.04	
Haskell	99	42	69.4	1.54	
Hearne	89	51	73.6	2.55	
Henrietta	94	38	71.1	0.38	
Hewitt	.....	.....	.....	0.27	
Hondo	.....	.....	.....	T.	
Houston	90	44	69.6	2.29	
Huntsville	92	41	68.6	0.93	
Ira	.....	38	.....	0.88	
Jacksonville	89	38	64.8	3.41	
Jasper	90	41	69.1	1.00	
Kaufman	92	43	68.9	.....	
Kent	.....	.....	.....	1.34	
Kerrville	96	35	67.2	0.08	
Kopperl	.....	.....	.....	1.28	
Lampasas	97	38	70.3	0.25	
Laureles Ranch	.....	.....	.....	0.30	
Llano[e5]	92	44	72.1	0.20	
Longview	91	40	67.2	3.74	
Luling	94	41	70.9	0.10	
Mann	89	39	69.2	1.67	
Menardville	91	36	66.8	0.00	
Mount Blanco	89	37	63.6	T.	
Nacogdoches	91	38	65.4	4.50	
New Braunfels	92	40	69.8	0.02	
Panter	.....	.....	.....	1.70	
Paris *a*	93	37	68.6	1.10	
Port Lavaca	89	59	74.0	1.86	
Rhineland	97	41	70.4	0.22	
Rockisland	93	46	70.6	2.78	
Rockport	88	62	75.3	0.00	
Runge	97	40	72.3	0.67	
Sanderson	90	50	70.1	2.25	
San Marcos	92	39	69.7	0.15	
San Saba	93	37	69.4	0.26	
Santa Gertrudes Ranch	.....	.....	.....	1.89	
Shaeffer Ranch	94	50	74.9	0.52	
Sherman	87	43	68.4	2.22	
Sulphur Springs	88	38	67.9	1.55	
Temple *a*	93	48	70.8	2.27	
Temple *b*	93	43	69.6	2.25	
Trinity	90	38	68.8	0.92	
Tyler	91	45	68.0	0.56	
Victoria	.....	.....	.....	3.50	
Waco	94	44	69.8	0.50	
Waxahachie	95	37	68.7	1.25	
Weatherford	91	45	70.0	2.27	
Wichita Falls	.....	.....	.....	T.	
Utah.					
Alpine	.....	.....	.....	1.67	
Aneth	88	30	57.9	0.36	
Blackrock	83	25	50.8	0.56	
Bluecreek	.....	.....	.....	1.41	
Castledale	80	21	47.4	0.40	
Cisco	84	36	57.4	0.00	
Corinne	92	32	55.2	2.81	
Deseret	89	22	51.5	0.50	
Emery	77	26	49.8	T.	
Escalante	79	33	53.5	0.56	
Farmington	81	40	55.2	2.20	
Fillmore[d]	90	28	55.8	0.72	
Fort Duchesne	81	20	48.6	0.64	
Frisco	78	31	53.4	0.68	
Giles	89	25	54.4	0.25	
Government Creek	82	30	51.8	0.65	
Grover	79	31	52.0	0.06	
Heber	83	21	47.7	1.70	
Henefer	83	20	47.7	1.32	
Huntsville	.....	.....	.....	1.84	
Kelton[e1]	85	38	51.2	1.25	
Levan	85	29	50.6	1.31	
Loa	75	10	41.2	0.26	
Logan	81	36	53.6	1.83	
Manti	80	26	50.6	1.05	
Marysvale	83	24	50.8	0.80	
Meadowville	74	24	46.0	0.75	
Millville	.....	.....	.....	2.29	
Minersville	80	31	52.8	0.70	
Moab	87	33	57.4	1.41	
Mount Pleasant	83	30	52.6	1.32	
Ogden[e1]	83	37	53.4	2.12	
Park City	82	28	52.8	0.18	T.
Parowan	80	29	52.1	0.32	
Pinto	79	23	48.5	1.43	
Provo	86	30	53.0	.....	
St. George	93	30	60.4	1.06	
Scipio	83	20	50.3	1.31	
Snowville	87	36	55.6	2.76	
Soldier Summit	74	18	44.4	0.92	T.
Terrace	.....	.....	.....	2.75	
Thistle	87	23	50.0	1.15	
Tooele	80	35	54.2	1.14	
Tropic	75[e]	16[e]	46.4[e]	0.52	
Vernal	85	30	53.5	0.42	
Wellington	84[e]	22	51.1	0.57	
Woodruff	70	5	41.2	1.00	
Vermont.					
Bennington	75	25	50.6	2.14	0.4
Burlington	71	30	51.4	2.88	
Chelsea	67	24	45.0	1.71	
Cornwall	74	24	50.9	2.03	
Enosburg Falls	76	18	47.6	3.26	
Hartland	72	17	46.3	2.23	T.
Jacksonville	70	15	46.6	2.49	1.0
Manchester	70	23	46.6	1.79	T.
Newport	75	27	49.7	2.08	T.
Norwich	72	19	46.6	1.95	T.
St. Johnsbury	73	18	47.2	2.31	T.
Vernon	.....	.....	.....	3.87	
Wells	72	25	47.7	1.93	
Woodstock	68	18	45.0	1.65	
Virginia.					
Alexandria	82	33	55.6	0.89	
Ashland	81	32	56.8	1.40	
Barboursville	88	32	59.8	0.47	
Bedford	83	34	58.2	0.43	
Bigstone Gap	83	27	54.9	0.91	
Birdsnest[2]	.....	.....	56.2	1.65	
Blacksburg	78	23	52.0	0.96	
Bon Air	82	37	58.4	0.99	
Buckingham	87	35	60.0	0.46	
Burkes Garden	72	21	48.4	1.86	
Callaville	84	31	58.8	2.18	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Virginia—Cont'd.	°	°	°	*Ins.*	*Ins.*
Charlottesville	83	36	59.4	0.57	
Clifton Forge	77	33	55.4	0.40	
Columbia	86	25	57.0	0.40	
Dale Enterprise	81	28	54.8	2.06	
Farmville	84	29	57.4	0.10	
Fredericksburg	80	31	55.9	0.46	
Grahams Forge	76[k]	25[k]	52.7[k]	1.36	
Hampton	80	40	61.4	1.23	
Hot Springs	75	26	50.8	0.70	
Lexington	.....	.....	.....	0.81	
Lincoln	83	29	55.2	0.68	
Manassas	79	31	56.3	0.10	
Newport News	80	42	62.3	1.78	
Petersburg	84	32	59.2	2.71	
Quantico	86	33	59 0	.....	
Radford	.....	.....	.....	0.81	
Riverton	.....	.....	.....	0.28	
Roanoke	74	29	51.8	0.90	
Salem	.....	.....	.....	0.71	
Speers Ferry	.....	.....	.....	1.86	
Spottsville	83	31	57.2	1.72	
Staunton	84	31	56.8	0.51	
Stephens City	83	29	55.7	0.22	
Warsaw	73	29	52.2	1.81	
Westpoint	75	34	53.1	2.45	
Williamsburg	79	40	59.0	3.15	
Woodstock	80	30	55.4	0.28	
Wytheville	79	27	54.7	1.86	
Washington.					
Aberdeen	80	33	56.2	4.37	
Anacortes	.....	.....	.....	1.99	
Ashford	.....	.....	.....	4.99	
Bremerton	82	39	56.9	2.74	
Brinnon	72	41	54.4	2.60	
Buchanan's Farm	.....	.....	.....	0.01	
Cedonia	74	33	51.3	0.44	
Cheney	.....	.....	.....	0.20	
Clearwater	73°	36°	55.6°	10.71	
Cle Elum	81	24	51.8	1.44	
Colfax	86	30	55.2	0.52	
Colville	82	25	50.2	0.47	
Conconully	74	32	51.2	0.21	
Coupeville	77	39	55.0	1.93	
Crescent	78	31	51.0	0.27	
East Sound	79	33	52.6	3.00	
Ellensburg	76	26	52.1	0.27	
Ellensburg (near)	84	26	52.0	0.08	
Grandmound	78	37	57.2	2.70	
Granite Falls	.....	.....	.....	4.64	
Hooper	85	34	55.6	0.16	
Ilwaco	79	44	57.8	6.89	
Lacenter	78	40	56.4	3.01	
Lakeside	74	38	55.7	0.08	
Lind	83	32	57.4	0.15	
Mayfield	76	36	55.4	3.29	
Monte Cristo	78	34	53.8	8.43	2.0
Mottinger Ranch	84	40	60.3	0.01	
Mount Pleasant	75	43	57.4	1.92	
Moxee Valley	84	28	55.9	0.10	
Northport	71	21	47.8	1.00	
Olga	70	42	54.6	2.11	
Olympia	80	34	56.3	2.94	
Pasco	87	34	58.8	0.00	
Pinehill	79	37	58.4	0.18	
Pomeroy	85	35	58.6	0.37	
Port Townsend	74	44	54.9	1.67	
Pullman	81	33°	54.8°	0.60	
Renton	.....	.....	.....	2.19	
Ritzville	.....	.....	.....	T.	
Rosalia	77	30	53.8	0.27	
Sedro	82	34	55.2	4.15	
Silvana	80	31	54.6	2.86	
Snohomish	81	36	54.6	4.05	
Snoqualmie	78	27	50.4	2.36	
Southbend	82	40	57.4	5.02	
Sprague	.....	.....	.....	0.75	
Stampede	.....	.....	.....	6.65	1.0
Sunnyside	80	32	56.0	0.09	
Twin	74	40	52.6	3.75	
Union	80	34	56.6	4.93	
Usk	80	25	48.4	0.43	
Vancouver	79	38	57.9	1.10	
Vashon	68	43	55.0	2.73	
Waterville	78	28	52.8	T.	
Wenatchee (near)	84	32	55.2	0.28	
Whatcom	76	32	53.5	2.99	
Wilbur	82	23	53.4	0.11	
West Virginia.					
Beckley	78	24	52.7	.....	
Beverly	80	23	51.2	1.07	
Bluefield	77	27	53.2	1.05	
Buckhannon	79	26	52.2	0.66	
Burlington	84	25	52.1	0.15	
Byrne	83	29	58.6	0.40	
Camden	74	24	53.7	0.24	
Central	81	26	53.7	0.78	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
West Virginia—Cont'd.	°	°	°	*Ins.*	
Chapel	75	32	53.4	1.95	
Charleston	.....	.....	.....	0.70	
Creston	.....	.....	.....	0.08	
Dayton	81	23	53.1	0.12	
Elkhorn	79	29	55.2	0.60	
Fairmont	.....	.....	.....	0.38	
Glenville	83	26	55.0	0.70	
Grafton	80	25	53.8	0.43	
Green Sulphur	79	26	52.6	0.53	
Harpers Ferry	.....	.....	.....	0.60	
Hinton *a*	.....	.....	.....	0.69	
Hinton *b*	82	31	54.9	.....	
Huntington	81	29	55.2	0.32	
Josiah	82	30	55.6	0.45	
Lewisburg	78	24	51.8	0.82	
Magnolia	80	24	53.2	0.31	
Mannington	81	27	54.6	0.20	
Martinsburg	79	29	52.9	0.55	
Morgantown	78	27	55.4	0.36	
Moscow	75	28	53.1	0.35	
New Martinsville	85	29	57.4	0.39	
Nuttallburg	82	29	54.1	0.25	
Oceana	80	28	54.4	0.91	
Oldfields	82	30	55.1	0.25	
Parsons	80	25	52.0	0.75	
Philippi *a*	82	19	50.0	0.51	
Point Pleasant	84	31	57.6	0.20	
Powellton	86	31	56.5	0.83	
Princeton	75	28	51.8	1.60	
Romney	80	26	54.1	0.15	
Rowlesburg	.....	.....	.....	0.53	
Spencer	83	27	55.6	2 07	
Uppertract	82	25	54.6	0 18	
Wellsburg	76	29	53.0	0.26	T.
Weston *a*	.....	.....	.....	0.30	
Weston *b*	84	28	55.6	.....	
Wheeling *a*	.....	.....	.....	0.19	
Wheeling *b*	82	35	58.2	0.12	
Williamson	83	31	58.4	0.55	
Wisconsin.					
Amherst	78	24	48.8	4.88	
Antigo	76	22	48.5	1.97	T.
Appleton	.....	29	.....	2.26	
Ashland	.....	.....	.....	2.00	
Barron	78	30	47.6	1.28	
Beloit	79	29	53.0	0.88	
Brodhead	83	26	53 6	1.57	
Chilton	79	25	49.2	2.25	
Citypoint	82	25	52.1	4.23	
Darlington	80	20	49.9	1.76	
Dodgeville	81	23	52.1	2.71	
Easton	81	22	49.8	3.51	
Eau Claire	69	27	48.4	4.64	
Florence	78	23°	47.6°	2.08	
Fond du Lac	79	28	52.0	2.32	
Grand River Locks	.....	.....	.....	4.45	
Grantsburg	82	30	48.6	1.68	
Hartland	80	26	52.2	1.21	
Harvey	79	28	52.1	2.77	
Hayward	81	19	47.0	1.33	T.
Hillsboro	80	22	50.6	4.23	
Knapp	74	22	47.6	1.39	T.
Koepenick	78	20	47.4	3.10	1.0
Ladysmith	76	19	47.4	1.10	
Lancaster	80	25	52.0	3.32	
Madison	78	32	52.4	2.49	
Manitowoc	77	27	49.6	2.66	
Meadow Valley	83	24	49.7	3.74	
Medford	78	24	49.0	2.80	
Menasha	.....	.....	.....	5.49	
New Holstein	78	24	51.0	1 74	
New London	80	25	50.1	3.93	
North Crandon	76	12	45.4	1.47	T.
Oconto	78	26	50.6	3.42	
Osceola	81	17	48.0	1.71	T.
Pepin	80	30	53.1	1.52	
Pine River	83	24	50.8	3.96	T.
Portage	83	28	52.9	2.67	
Port Washington	82	24	51.5	1.03	
Prairie du Chien *a*	84	28	55.8	2.44	
Prairie du Chien *b*	.....	.....	.....	3.03	
Prentice	78	22	46.6	2.28	T.
Racine	86	30	55.8	0.86	
Shawano	80	25	49.3	3.54	
Sheboygan	79	30	52.8	1.86	
Stevens Point	77	24	49.4	4.47	
Valley Junction	83	25	51.8	5.75	
Viroqua	78	26	51.0	4.79	T.
Watertown	78	25	50.0	2.19	
Waukesha	79	30	53.3	1.00	T.
Waupaca	79	25	50.5	2.66	
Wausau	76	24	49.2	2.04	T.
Wausaukee	79	21	48.4	3.31	
Westbend	80	29	54.7	1.51	
Westfield	80	25	50.4	3.16	
Whitehall	77	25	50.1	3.37	

Stations	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
Wyoming.	°	°	°	*Ins.*	*Ins.*
Alcova	80	27	51.6	1.45	6.0
Basin	.....	.....	.....	0.12	T.
Bitter Creek	86	16	49.4	0.64	6.0
Buffalo	74	21	50.4	1.07	T.
Casper	78	27	50.1	1.49	T.
Centennial	67	20	41.4	0.56	
Chugwater	73	19	47.6	0.57	
Daniel	71	10	41.1	1.20	
Evanston	74	25	48.6	1.82	T.
Fort Laramie	79	21	49.6	0.31	
Fort Washakie	72	22	47.4	0.19	
Fort Yellowstone	71	26	45.6	0.90	1.0
Fourbear	71	23	46.4	0.47	T.
Griggs	78	19	49.6	1.08	T.
Hyattville	75	28	51.4	0.05	
Iron Mountain	73	23	45.8	0.75	0.4
Laramie	72	22	44.4	1.28	T.
Leo	72	25	44.9	1.37	T.
Lusk	69	20	46.4	1.46	
Moore	72	18	45.9	0.44	3.0
Parkman	77	31	51.0	1.16	1.0
Pinebluff	78	25	47.6[e]	0.20	T.
Rawlins	73	22	45.6	0.93	0.2
Rocksprings	76	18	46.5	0.17	T.
Saratoga	72	24	46.7	1.34	2.0
Sheridan	78	27	50.0	0.70	
South Pass City	66	16[k]	42.0[d]	0.50	3.0
Thayne	74	20	44.6	0.76	
Thermopolis	73	26	50.8	0.38	
Cuba.					
Aguacate	93	71	80.5	7.74	
Alvarez	.....	.....	.....	4.12	
Australia	90	63	78.2	2.39	
Banaguises	92	64	77.0	2.05	
Batabano	89	64	77.4	0.66	
Camajuani	89	65	77.1	11.87	
Ciego de Avila	.....	.....	.....	4.00	
Cruces	.....	.....	.....	1.49	
Gibara	95	69	78.7	11.18	
Guabairo	.....	.....	.....	4.23	
Guanajay	87	65	75.6	3.51	
Guantanamo	93	67	79.6	20.11	
Guines	89	66	74.0	0.00	
Holguin	93	64	79.4	6.34	
Isabel, Guantanamo	.....	.....	.....	16.19	
Los Canos	94	64	79.9	17.40	
Luisa, Guantanamo	.....	.....	.....	16.50	
Magdalena	.....	.....	.....	1.23	
Manzanillo	92	72	81.3	5.26	
Moron Trocha	95	66	80.6	7.40	
Pinar del Rio	90	66	78.7	4.81	
Romelle, Guantanamo	.....	.....	.....	13.68	
San Ceyetano	96	60	78.0	10.19	
Sancti Spiritus	87	71	77.2	1.30	
San Emelio, Guanta'mo	.....	.....	.....	17.85	
Santa Clara	92	60	73.4	11.62	
Santa Cruz del Sur	88	62	77.8	4.58	
Soledad	90	65	77.6	1.52	
Soledad, Guantanamo	94	65	79.0	20.81	
Yaguajay	93	69	79.0	8.20	
Yateras	.....	.....	.....	16.11	
Porto Rico.					
Adjuntas	88	59	73.8	10.94	
Aguirre	90	68	80.4	7.81	
Arecibo	93	68	79.2	11.74	
Barros	.....	.....	.....	18.53	
Bayamon	.....	68	.....	9.45	
Caguas	88	61	76.5	18.50	
Canovanas	90	73	80.4	11.89	
Cayey	96	64	77.0	12.16	
Cidra	.....	.....	.....	9.36	
Coamo	93	67	79.7	12.09	
Corozal	91	64	78.3	16.47	
Fajardo	96	70	81.6	8.81	
Guayamo	.....	.....	.....	9.61	
Hacienda Amistad	92	63	78 4	6.30	
Hacienda Coloso	93	65	79.0	9.09	
Hacienda Perla	90	71	80.8	15.08	
Humacao	90	64	76.2	15.80	
Isabela	98	60	80.2	9.26	
Juan Diaz	92	68	80.2	5.81	
La Isolina	89	66	76.7	19.84	
Las Marias	94	68	80.0	7.82	
Manati	95	67	80.4	11.29	
Maunabo	93	71	82.0	11.15	
Mayaguez	94	67	80.1	11.37	
Morovis	89	62	76.6	15.78	
San German	.....	.....	.....	9.38	
San Lorenzo	.....	66	.....	13.07	
San Salvador	89	64	76.3	12.64	
Santa Isabel	94	69	81.2	7.29	
Utuado	.....	61	.....	17.19	
Vieques	92	77	84.0	6.05	
Yauco	.....	68	.....	3.86	
Mexico.					
Ciudad P. Diaz	94	56	74.7	0.13	

TABLE II.—*Climatological record of voluntary and other cooperating observers*—Continued.

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.*	Precipitation. Rain and melted snow.	Total depth of snow.
Mexico—Cont'd.	°	°	°	*Ins.*	*Ins.*
Coatzacoalcos	90	60	76.3	10.94	
Leon de Aldamas	78	41	61.2	0.95	
Pueblo	77	47	62.2	0.36	
Vera Cruz	87	70	78.6	1.52	
New Brunswick.					
St. John	63	29	47.7	1.95	T.
Isthmus of Panama.					
Alhajuela	89	69	76.5	22.22	
La Boca	88	74	79.9	11.34	

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Alabama.	°	°	°	*Ins.*	*Ins.*
Helena				2.26	
Alaska.					
Fort Liscum	64	25	44.0	12.72	
Juneau	65	36	49.4	11.41	
Killisnoo	63	36	50.0	5.50	
Orca	74	35	49.8	26.36	
Sitka	65	39	51.4	9.82	
Teller	69	22	43.1	T.	
Tyoonok	68	32	47.9	3.16	
Arkansas.					
Elon	94°	39°	72.4°	3.59	
California.					
Goshen*[5]	98	50	72.8	0.00	

Stations.	Temperature. (Fahrenheit.) Maximum.	Minimum.	Mean.	Precipitation. Rain and melted snow.	Total depth of snow.
California—Cont'd.	°	°	°	*Ins.*	*Ins.*
Keene				0.00	
Kernville				0.00	
Lemoore*[1]	96	50	75.8	0.33	
Riovista				0.50	
Riverside	95	43	67.2	T.	
San Miguel Island	70	46	57.8	0.30	
Santa Maria	85	40	61.0	0.12	
Colorado.					
Arkins				1.12	
Holyoke (near)	92°	32°	63.0°	1.24	
Walden	76	15	48.0	0.05	
Yuma				0.36	
Connecticut.					
Wallingford				5.55	
District of Columbia.					
Distributing Reservoir*[5]	88	47	67.7	1.83	
Louisiana.					
Jeanerette	97°	50°	78.2°		
Mississippi.					
Nittayuma	92	43	72.7	6.79	
Montana.					
Crow Agency	91	28	54.8	1.05	
Toston	83	26	49.7	1.76	T.
New York.					
New Rochelle	86	34	63.6	1.98	
Oregon.					
The Dalles	85	37	60.0	1.84	
Wyoming.					
Embar	94	20	54.6	0.06	

EXPLANATION OF SIGNS.

* Extremes of temperature from observed readings of dry thermometer.

A numeral following the name of a station indicates the hours of observation from which the mean temperature was obtained, thus:

[1] Mean of 7 a. m. + 2 p. m. + 9 p. m. + 9 p. m. ÷ 4.
[2] Mean of 8 a. m. + 8 p. m. ÷ 2.
[3] Mean of 7 a. m. + 7 p. m. ÷ 2.
[4] Mean of 6 a. m. + 6 p. m. ÷ 2.
[5] Mean of 7 a. m. + 2 p. m. ÷ 2.
[6] Mean of readings at various hours reduced to true daily mean by special tables.
[7] Mean from hourly readings of thermograph.
[9] Mean of sunrise and noon.
[10] Mean of sunrise, noon, sunset, and midnight.

The absence of a numeral indicates that the mean temperature has been obtained from daily readings of the maximum and minimum thermometers.

An italic letter following the name of a station, as "Livingston *a*," "Livingston *b*," indicates that two or more observers, as the case may be, are reporting from the same station. A small roman letter following the name of a station, or in figure columns, indicates the number of days missing from the record; for instance "s" denotes 14 days missing.

No note is made of breaks in the continuity of temperature records when the same do not exceed two days. All known breaks, of whatever duration, in the precipitation record receive appropriate notice.

CORRECTIONS.

NOTE.—The following changes have been made in the names of stations: Oklahoma, Vittum changed to Guthrie; Oregon, Harris changed to Blackbutte.

TABLE III.—*Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of October, 1901.*

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
New England.	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
Eastport, Me	10	21	2	37	s. 73 w.	37
Portland, Me	17	25	3	33	s. 75 w.	31
Northfield, Vt	18	39	3	9	s. 16 w.	22
Boston, Mass	16	22	4	35	s. 79 w.	32
Nantucket, Mass	14	26	12	26	s. 60 w.	16
Block Island, R. I	20	18	13	29	n. 83 w.	16
New Haven, Conn	25	21	7	23	n. 76 w.	16
Middle Atlantic States.						
Albany, N. Y	17	31	11	14	s. 12 w.	14
Binghamton, N. Y†	8	7	14	10	n. 76 e.	4
New York, N. Y	20	22	12	26	s. 82 w.	14
Harrisburg, Pa†	8	8	10	13	w.	3
Philadelphia, Pa	17	21	11	27	s. 76 w.	16
Scranton, Pa	22	21	10	23	n. 86 w.	13
Atlantic City, N. J	22	15	15	26	n. 58 w.	13
Cape May, N. J	24	16	13	19	n. 37 w.	10
Baltimore, Md	21	16	19	20	n. 11 w.	5
Washington, D. C	25	18	14	17	n 23 w.	8
Lynchburg, Va	20	17	20	18	n. 34 e.	4
Norfolk, Va	32	15	23	9	n. 39 e.	22
Richmond, Va	29	22	12	11	n. 3 e.	17
South Atlantic States.						
Charlotte, N. C	27	15	30	8	n. 61 e.	25
Hatteras, N. C	40	11	13	9	n. 8 e.	21
Raleigh, N. C	41	9	8	13	n 9 w.	32
Wilmington, N. C	31	11	24	8	n. 39 e.	26
Charleston, S. C	40	7	22	8	n. 21 e.	40
Columbia, S. C	35	8	22	13	n. 21 e.	25
Augusta, Ga	34	5	16	21	n. 10 w.	29
Savannah, Ga	37	5	28	6	n. 34 e.	39
Jacksonville, Fla	42	3	23	8	n. 21 e.	42
Florida Peninsula.						
Jupiter, Fla	33	4	36	8	n. 44 e.	40
Key West, Fla	39	4	38	2	n. 46 e.	50
Tampa, Fla	47	3	17	7	n. 13 e.	45
Eastern Gulf States.						
Atlanta, Ga	25	10	27	13	n. 43 e.	20
Macon, Ga†	23	1	7	3	n. 10 e.	23
Pensacola, Fla†	21	1	16	2	n. 35 e.	24
Mobile, Ala	42	8	10	10	n.	34
Montgomery, Ala	21	5	36	9	n. 59 e.	31
Meridian, Miss	14	3	17	3	n. 86 e.	14
Vicksburg, Miss	25	7	36	8	n. 37 e.	33
New Orleans, La	33	11	28	7	n. 41 e.	30
Western Gulf States.						
Shreveport, La	13	23	33	8	s. 68 e.	27
Fort Smith, Ark	18	5	30	11	n. 56 e.	23
Little Rock, Ark	20	20	16	19	w.	3
Corpus Christi, Tex	21	17	33	5	n. 82 e.	28
Fort Worth, Tex	9	29	21	13	s. 22 e.	20
Galveston, Tex	19	10	42	4	n. 77 e.	39
Palestine, Tex	15	22	30	4	s. 73 e.	27
San Antonio, Tex	19	14	40	1	n. 83 e.	39
Ohio Valley and Tennessee.						
Chattanooga, Tenn	16	20	18	22	s. 45 w.	6
Knoxville, Tenn	28	13	21	15	n. 22 e.	16
Memphis, Tenn	19	18	22	16	n. 80 e.	6
Nashville, Tenn	23	20	14	20	n. 63 w.	7
Lexington, Ky†	3	17	8	8	s.	14
Louisville, Ky	13	28	16	20	s. 15 w.	16
Evansville, Ind†	8	13	8	5	s. 31 e.	6
Indianapolis, Ind	15	32	9	20	s. 33 w.	20
Cincinnati, Ohio	12	22	22	20	s. 11 e.	10
Columbus, Ohio	13	23	16	23	s. 35 w.	12
Pittsburg, Pa	24	15	10	28	n. 63 w.	20
Parkersburg, W. Va	17	26	7	21	s. 57 w.	17
Elkins, W. Va	14	17	5	29	s. 83 w.	24
Lower Lake Region.						
Buffalo, N. Y	16	28	7	24	s. 55 w.	21
Oswego, N. Y	12	39	5	16	s. 22 w.	29
Rochester, N. Y	4	34	3	34	s. 46 w.	43
Erie, Pa	12	27	7	25	s. 50 w.	23
Cleveland, Ohio	12	33	20	12	s. 21 e.	23
Sandusky, Ohio	11	32	10	27	s. 31 w.	27
Toledo, Ohio	13	29	9	23	s. 41 w.	21
Detroit, Mich	16	24	8	28	s. 68 w.	22
Upper Lake Region.						
Alpena, Mich	15	21	5	34	s. 78 w.	30
Escanaba, Mich	18	22	5	30	s. 81 w.	25
Grand Haven, Mich	18	27	9	22	s. 35 w.	16
Houghton, Mich.†	12	4	9	11	n 14 w.	28
Marquette, Mich	18	18	7	33	w.	26
Port Huron, Mich	13	28	8	28	s. 53 w.	25
Sault Ste. Marie, Mich	19	17	22	21	n 27 e.	2
Chicago, Ill	15	21	10	29	s. 72 w.	20
Milwaukee, Wis	14	21	8	30	s. 77 w.	23
Green Bay, Wis	12	29	9	23	s. 43 w.	23
Duluth, Minn	31	10	13	27	n. 34 w.	25
North Dakota.						
Moorhead, Minn	19	25	16	22	s. 45 w.	8
Bismarck, N. Dak	22	17	12	28	n. 72 w.	17
Williston, N. Dak	19	21	9	26	s. 83 w.	17
Upper Mississippi Valley.						
St. Paul, Minn	15	27	10	27	s. 55 w.	21

Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.
***Upper Mississippi Valley*—Cont'd.**	*Hours.*	*Hours.*	*Hours.*	*Hours.*	°	*Hours.*
La Crosse, Wis†	9	16	5	8	s. 23 w.	8
Davenport, Iowa	11	21	12	30	s. 61 w.	21
Des Moines, Iowa	22	18	10	25	n. 72 w.	14
Dubuque, Iowa	10	29	10	27	s. 42 w.	26
Keokuk, Iowa	16	27	10	25	s. 54 w.	19
Cairo, Ill	18	30	16	12	s. 18 e.	13
Springfield, Ill	19	21	12	25	s. 81 w.	13
Hannibal, Mo†	7	12	6	12	s. 50 w.	8
St. Louis, Mo	19	25	12	11	s. 9 e.	6
Missouri Valley.						
Columbia, Mo*	9	9	7	10	w.	3
Kansas City, Mo	18	26	12	17	s. 32 w.	9
Springfield, Mo	16	28	14	15	s. 5 w.	12
Lincoln, Nebr	21	22	16	17	s. 45 w.	1
Omaha, Nebr	17	26	11	18	s. 38 w.	11
Valentine, Nebr	18	21	7	28	s. 28 w.	21
Sioux City, Iowa†	9	13	9	8	s. 14 e.	4
Pierre, S. Dak	18	18	27	15	e.	12
Huron, S. Dak	15	26	18	21	s. 13 w.	11
Yankton, S. Dak†	11	6	3	18	n. 72 w.	16
Northern Slope.						
Havre, Mont	14	22	10	34	s. 72 w.	25
Miles City, Mont	17	19	14	26	s. 81 w.	12
Helena, Mont	12	24	4	39	s. 71 w.	37
Kalispell, Mont	12	20	14	29	s. 62 w.	17
Rapid City, S. Dak	17	15	10	32	n. 95 w.	22
Cheyenne, Wyo	27	15	7	31	n. 63 w.	27
Lander, Wyo	10	31	8	31	s. 48 w.	31
North Platte, Nebr	13	21	17	26	s. 48 w.	13
Middle Slope.						
Denver, Colo	18	26	16	19	s. 21 w.	8
Pueblo, Colo	21	13	22	25	n. 21 w.	8
Concordia, Kans	14	34	14	9	s. 14 e.	21
Dodge, Kans	18	24	24	15	s. 56 e.	11
Wichita, Kans	15	38	14	4	s. 23 e.	25
Oklahoma, Okla	16	25	18	5	s. 55 e.	16
Southern Slope.						
Abilene, Tex	9	33	50	6	s. 45 e.	34
Amarillo, Tex	15	32	18	18	s.	17
Southern Plateau.						
El Paso, Tex	23	12	27	16	n. 45 e.	16
Santa Fe, N. Mex	16	23	31	8	s. 73 e.	24
Flagstaff, Ariz	20	15	21	16	n. 45 e.	7
Phoenix, Ariz	11	13	33	16	s. 83 e.	17
Yuma, Ariz	16	14	24	19	n. 68 e.	5
Independence, Cal	25	20	7	25	n. 74 w.	19
Middle Plateau.						
Carson City, Nev	21	18	12	29	n. 80 w.	17
Winnemucca, Nev	25	13	26	15	n. 43 e.	16
Modena, Utah	7	9	17	34	s. 83 w.	17
Salt Lake City, Utah	17	22	21	19	s. 22 e.	5
Grand Junction, Colo	15	18	28	15	s. 77 e.	13
Northern Plateau.						
Baker City, Oreg	17	33	13	15	s. 7 w.	16
Boise, Idaho	22	12	19	22	n. 17 w.	10
Lewiston, Idaho†	3	13	14	7	s. 35 e.	12
Pocatello, Idaho	3	31	22	21	s. 2 e.	28
Spokane, Wash	19	21	23	13	s. 79 e.	10
Walla Walla, Wash	3	35	17	17	s.	32
North Pacific Coast Region.						
Neah Bay, Wash	2	21	28	23	s. 15 e.	20
Port Crescent, Wash*	0	5	17	12	s. 45 e.	7
Seattle, Wash	16	25	20	14	s. 34 e.	11
Tacoma, Wash	23	27	7	18	s. 70 w.	12
Astoria, Oreg	8	32	15	22	s. 16 w.	25
Portland, Oreg	18	21	9	33	s. 83 w.	24
Roseburg, Oreg	17	11	21	27	n. 45 w.	8
Middle Pacific Coast Region.						
Eureka, Cal	21	19	9	27	n. 84 w.	18
Mount Tamalpais, Cal	30	12	9	27	n. 43 w.	26
Red Bluff, Cal	39	10	11	10	n. 2 e.	29
Sacramento, Cal	19	23	23	11	s. 72 e.	14
San Francisco, Cal	9	13	5	42	s. 84 w.	37
South Pacific Coast Region.						
Fresno, Cal	24	13	11	28	n. 57 w.	20
Los Angeles, Cal	12	8	12	38	n. 81 w.	26
San Diego, Cal	26	8	12	26	n. 38 w.	23
San Luis Obispo, Cal	29	16	4	18	n. 47 w.	19
West Indies.						
Basseterre, St. Kitts Island	30	11	24	8	n. 40 e.	25
Bridgetown, Barbados	8	27	41	4	s. 63 e.	42
Cienfuegos, Cuba	39	2	43	2	n. 48 e.	55
Grand Turk†	8	6	18	3	n. 82 e.	15
Havana, Cuba	31	1	41	2	n. 52 e.	49
Kingston, Jamaica	47	1	28	1	n. 30 e.	53
Port of Spain, Trinidad	14	17	39	3	s. 85 e.	36
Puerto Principe, Cuba	31	7	33	10	n. 44 e.	33
Roseau, Dominica, W. I	22	12	38	3	n. 74 e.	36
San Juan, Porto Rico	2	41	17	16	s. 1 e.	39
Santiago de Cuba, Cuba	43	10	17	3	n. 23 e.	36
Santo Domingo, W. I	46	9	8	4	n. 6 e.	37
Willemstad, Curaçao	11	11	46	2	e.	44

*From observations at 8 p. m. only.

†From observations at 8 a. m. only.

TABLE IV.—*Thunderstorms and auroras, October*, 1901.

States.	No. of stations.		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Total. No.	Total. Days.	
Alabama	52	T.	7	2	....	....	....	..	....	...	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	11	3	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Arizona	56	T.	1	4	1	1	4	1	....	....	....	....	....	....	....	....	....	....	....	3	1	8	...	2	....	1	....	....	....	....	1	2	....	30	13	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Arkansas	57	T.	....	1	....	....	....	....	....	2	....	...	1	1	....	....	....	1	...	....	....	2	....	....	....	....	....	6	1	....	....	....	....	15	8	T.
		A.	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
California	167	T.	11	3	....	....	....	....	....	....	1	....	....	....	....	..	....	....	2	....	....	....	....	3	10	7	4	6	3	2	2	....	....	54	12	T.
		A.	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Colorado	81	T.	....	....	3	2	....	6	2	....	....	6	1	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	5	....	....	....	....	26	8	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Connecticut	21	T.	....	7	....	....	....	....	....	....	....	....	....	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9	3	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Delaware	5	T.	...	....	....	....	....	.	....	....	....	....	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Dist. of Columbia	4	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Florida	47	T.	3	3	1	....	....	....	....	....	....	....	....	2	1	2	....	...	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	12	6	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Georgia	55	T.	9	2	....	....	....	....	....	....	....	....	....	3	....	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	14	3	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Idaho	34	T.	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	2	2	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Illinois	92	T.	....	...	....	....	....	....	....	....	....	....	3	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4	2	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Indiana	58	T.	3	....	....	....	....	....	....	....	....	....	6	2	16	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	29	6	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Indian Territory	11	T.	....	....	....	....	....	....	....	....	....	....	3	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	4	2	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Iowa	149	T.	17	....	1	....	....	3	4	1	4	30	6	....	....	....	....	....	....	....	1	....	....	....	....	....	....	3	....	25	....	18	17	130	13	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Kansas	77	T.	1	1	3	11	13	10	10	2	7	16	12	4	....	..	....	1	....	....	..	....	1	...	....	1	4	10	8	14	....	6	8	143	21	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Kentucky	41	T.	....	....	....	....	....	....	....	....	....	....	....	2	1	..	....	7	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	11	4	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Louisiana	46	T.	3	....	....	....	....	....	....	....	1	....	1	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	8	4	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Maine	19	T.	....	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	2	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Maryland	48	T.	....	13	....	....	....	....	....	2	....	....	....	....	1	....	....	..	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	1	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	1	A.
Massachusetts	48	T.	....	5	....	..	....	....	....	....	....	....	....	....	....	....	....	....	1	....	1	....	....	....	....	....	....	....	....	....	....	....	....	15	3	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Michigan	106	T.	10	1	2	....	....	..	....	1	....	....	7	1	3	1	....	....	....	....	....	1	....	....	....	1	1	1	1	1	2	1	2	37	7	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Minnesota	67	T.	4	....	....	....	....	....	....	2	1	3	2	2	...	1	....	....	....	....	....	....	....	....	....	....	....	1	....	25	10	12	2	65	12	T.
		A.	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Mississippi	44	T.	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	1	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Missouri	95	T.	13	2	....	....	1	5	3	4	4	9	8	1	....	....	....	6	....	....	....	2	....	....	....	....	....	3	1	12	3	2	2	81	18	T.
		A.	...	....	....	....	....	....	....	1	....	....	...	1	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	3	A.
Montana	40	T.	....	....	....	....	....	....	....	....	....	....	..	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Nebraska	142	T.	1	1	....	1	1	18	12	5	4	21	3	1	....	....	....	....	....	....	....	....	....	....	....	....	6	1	13	20	3	12	9	132	18	T.
		A.	...	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	1	A.
Nevada	40	T.	....	....	...	4	4	....	....	....	....	....	....	....	....	....	....	....	1	1	....	....	....	2	....	2	1	....	....	....	....	....	....	15	7	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
New Hampshire	19	T.	....	4	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	6	3	T.
		A.	....	....	....	....	....	..	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	A.
New Jersey	51	T.	....	8	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	12	....	....	....	....	....	....	....	....	....	....	....	....	....	21	3	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
New Mexico	31	T.	....	1	2	....	4	3	....	....	....	....	....	1	....	....	....	....	....	1	1	....	....	....	....	....	2	1	....	2	2	4	24	12	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
New York	99	T.	1	7	1	...	....	....	....	....	1	1	....	....	7	3	...	....	1	....	4	....	....	....	....	....	....	....	....	....	....	....	....	26	9	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
North Carolina	56	T.	5	6	1	....	....	....	....	..	....	....	....	....	7	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	20	5	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
North Dakota	48	T.	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	2	2	T.
		A.	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	A.
Ohio	128	T.	4	1	2	....	....	....	....	....	....	....	1	....	8	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	17	2	T.
		A.	....	1	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	2	2	A.
Oklahoma	23	T.	....	1	....	4	1	....	3	....	....	....	5	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	14	5	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Oregon	74	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	2	....	....	....	....	....	....	....	....	3	2	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Pennsylvania	91	T.	....	15	1	....	...	....	....	....	....	....	....	....	1	2	....	....	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	21	5	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Rhode Island	7	T.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
South Carolina	46	T.	9	9	....	...	....	....	....	....	....	....	3	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	23	4	T.
		A.	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
South Dakota	56	T.	....	....	....	....	...	3	6	9	....	....	1	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	10	....	....	....	32	7	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	1	1	A.
Tennessee	56	T.	5	1	....	....	....	....	....	....	....	....	....	2	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	9	4	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Texas	95	T.	....	....	1	....	2	1	1	5	1	....	5	1	...	....	....	....	....	....	....	....	....	....	....	....	1	...	1	...	....	1	....	20	11	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Utah	47	T.	....	....	6	....	1	6	....	....	..	....	....	....	....	....	....	....	....	3	1	....	....	1	1	....	8	5	2	....	....	....	....	34	10	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Vermont	16	T.	....	1	....	....	....	....	....	....	....	....	....	....	1	....	....	..	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	3	3	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Virginia	50	T.	....	3	1	....	....	....	....	....	....	....	....	....	4	...	..	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	9	3	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Washington	64	T.	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	A.
West Virginia	43	T.	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	3	1	T.
		A.	....	....	..	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Wisconsin	60	T.	13	....	1	....	....	....	2	3	1	7	5	...	2	....	....	....	....	....	....	....	....	....	....	....	....	5	2	7	6	....	54	11	T.
		A.	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	0	0	A.
Wyoming	31	T.	....	....	....	4	3	2	....	....	....	3	....	....	....	....	....	....	....	....	....	....	....	....	....	1	....	..	4	....	....	....	....	17	6	T.
		A.	....	....	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1	1	A.
Sums	2,893	T.	123	105	31	27	34	59	43	34	25	96	71	33	57	12	0	19	7	7	25	14	1	5	15	16	18	42	44	116	26	63	50	1,218	....	T.
		A.	0	1	0	0	1	0	0	4	1	0	0	2	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	13	....	A.

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during October, 1901, at all stations furnished with self-registering gages.*

Stations.	Date.	Total duration. From—	Total duration. To—	Total am't of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	Depths of precipitation (in inches) during periods of time indicated. 5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Albany, N. Y.	13	7.30 p.m.	9.55 p.m.	1.86	7.35 p.m.	8.45 p.m.	0.01	0.09	0.17	0.35	0.48	0.73	0.91	1.00	1.15	1.23	1.31	1.41	1.64	1.80	.....
Alpena, Mich.	12-13	.....	.....	1.15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....
Atlanta, Ga.	1	.....	.....	0.40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.27	.....	.....	.....
Atlantic City, N.J.	13-14	.....	.....	1.15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.33	.....	.....	.....
Baltimore, Md.	13	.....	.....	0.82	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.69	.....	.....	.....
Binghamton, N. Y.	13	.....	.....	0.81	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.65	.....	.....	.....
Bismarck, N. Dak.	28	.....	.....	0.99	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.41	.....	.....	.....
Boise, Idaho	3	.....	.....	1.08	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.61	.....	.....	.....
Boston, Mass.	14-15	.....	.....	2.12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.56	.....	.....	.....
Buffalo, N. Y	2	.....	.....	0.29	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.16	.....	.....	.....
Cairo, Ill.	11-12	.....	.....	2.98	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.73	.....	.....	.....
Charleston, S. C.	1-2	.....	.....	0.41	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.41	.....	.....	.....
Chicago, Ill.	8-9	.....	.....	0.48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.32	.....	.....	.....
Cincinnati, Ohio	12	.....	.....	0.42	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.19	.....	.....	.....
Cleveland, Ohio	31	.....	.....	0.16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.13	.....	.....	.....
Columbia, Mo.	11-12	.....	.....	0.65	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.30	.....	.....	.....
Columbus, Ohio	16	.....	.....	0.09	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.07	.....	.....	.....
Denver, Colo.	11-12	.....	.....	0.26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....
Des Moines, Iowa	10-11	.....	.....	1.43	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....
Detroit, Mich.	12	.....	.....	1.32	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.26	.....	.....	.....
Dodge, Kans	10-11	.....	.....	0.71	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.45	.....	.....	.....
Duluth, Minn.	7	.....	.....	0.86	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.28	.....	.....	.....
Eastport, Me.	14-15	.....	.....	0.94	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.56	.....	.....	.....
Elkins, W.Va	13	.....	.....	0.20	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.08	.....	.....	.....
Erie, Pa.	16-17	.....	.....	1.02	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.14	.....	.....	.....
Escanaba, Mich.	10-11	.....	.....	1.47	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.30	.....	.....	.....
Evansville, Ind	11-12	7.40 p.m.	4.10 p.m.	4.18	12.15 p.m.	1.25 p.m.	2.70	0.05	0.09	0.17	0.27	0.38	0.48	0.56	0.64	0.69	0.75	0.92	1.06	.....	.....
Fort Worth, Tex.	11	7.40 p.m.	10.40 p.m.	1.08	7.42 p.m.	8.05 p.m.	T.	0.13	0.35	0.54	0.64	0.67	0.69	.....	.....	.....	.....	.....	.....	.....	.....
Fresno, Cal.	27	.....	.....	0.27	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Galveston, Tex.	7-8	9.30 p.m.	1.40 p.m.	13.93	11.30 p.m	11.59 p.m.	0.08	0.08	0.12	0.48	0.72	0.85	0.92	.....	.....	.....	.....	.....	.....	.....	.....
					1.25 a.m	2.00 a.m.	1.23	0.10	0.15	0.26	0.38	0.60	0.76	0.78	.....	.....	.....	.....	.....	.....	.....
					7.00 a.m	7.50 a.m.	2.66	0.08	0.25	0.38	0.52	0.77	0.88	0.92	1.28	1.42	1.80	.....	.....	.....	.....
					7.50 a.m	8.40 a.m.	.....	2.05	2.24	2.42	2.61	2.82	2.86	2.91	2.94	3.10	3.30	.....	.....	.....	.....
					8.40 a.m	9.30 a.m.	.....	3.53	3.61	3.78	3.92	4.19	4.29	4.35	4.45	4.64	4.70	.....	.....	.....	.....
					9.30 a.m	10.20 a.m.	.....	5.16	5.48	5.85	6.15	6.48	6.76	6.95	7.17	7.40	7.58	.....	.....	.....	.....
					10.20 a.m	11.10 a.m.	.....	7.67	7.74	7.85	7.96	8.09	8.21	8.33	8.43	8.57	8.68	.....	.....	.....	.....
					11.10 a.m	11.59 a.m.	.....	8.75	8.80	8.87	9.09	9.25	9.42	9.65	9.86	10.15	10.42	.....	.....	.....	.....
					11.59 a.m	1.20 p.m.	.....	10.79	11.03	11.18	11.36	11.46	11.54	11.62	11.68	11.70	11.75	11.79	.....	.....	.....
Grand Junction, Colo.	6	.....	.....	0.33	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.07	.....	.....	.....
Harrisburg, Pa.	13	.....	.....	0.48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.46	.....	.....	.....
Hatteras, N. C.	27	.....	.....	0.48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....
Huron, S. Dak.	7-8	.....	.....	0.61	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.33	.....	.....	.....
Indianapolis, Ind.	12	.....	.....	3.02	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.55	.....	.....	.....
Jacksonville, Fla.	2	.....	.....	0.94	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.56	.....	.....	.....
Jupiter, Fla.	3	9.15 p.m.	9.50 p.m.	0.71	9.20 p.m.	9.35 p.m.	0.01	0.21	0.46	0.64	0.69	0.70	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kalispell, Mont	29	.....	.....	0.15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.10	.....	.....	.....
Kansas City, Mo.	6	.....	.....	1.66	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.53	.....	.....	.....
Key West, Fla.	11	.....	.....	0.37	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.22	.....	.....	.....
Knoxville, Tenn	12	.....	.....	1.04	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.68	.....	.....	.....
Lexington, Ky.	12	10.38 a.m.	5.05 p.m.	0.89	4.00 p.m.	4.30 p.m.	0.25	0.07	0.08	0.14	0.31	0.45	0.57	.....	.....	.....	.....	.....	.....	.....	.....
Lincoln, Nebr.	25-26	.....	.....	1.57	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.85	.....	.....	.....
Little Rock, Ark.	11-12	.....	.....	1.04	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.20	.....	.....	.....
Los Angeles, Cal.	26	.....	.....	1.79	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.30	.....	.....	.....
Louisville, Ky.	12	.....	.....	0.29	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.09	.....	.....	.....
Macon, Ga.	12	.....	.....	1.07	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.51†	.....	.....	.....
Memphis, Tenn.	11-12	.....	.....	1.19	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.18	.....	.....	.....
Meridian, Miss.	12	.....	.....	0.63	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.44	.....	.....	.....
Milwaukee, Wis.	8-9	.....	.....	0.38	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.15	.....	.....	.....
Montgomery, Ala	12	.....	.....	0.12	.....	.....	.....	.....	.....	.....	0.12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Nantucket, Mass.	17-18	.....	.....	0.26	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.20	.....	.....	.....
Nashville, Tenn.	12	.....	.....	0.50	.....	.....	.....	.....	.....	0.12	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Haven, Conn.	13-14	.....	.....	2.22	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.54	.....	.....	.....
New Orleans, La.	9	.....	.....	0.65	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.44	.....	.....	.....
New York, N. Y.	13-14	.....	.....	1.90	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.23	.....	.....	.....
Norfolk, Va.	13-14	5.30 p.m.	2.50 p.m.	2.05	10.24 p.m.	10.45 p.m.	0.06	0.37	0.58	0.73	0.87	0.88	.....	.....	.....	.....	.....	.....	.....	.....	.....
Northfield, Vt.	13-14	.....	.....	0.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.35	.....	.....	.....
Oklahoma, Okla.	7-8	.....	.....	0.75	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.37	.....	.....	.....
Omaha, Nebr.	30	8.30 p.m.	D. N.	1.04	8.40 p.m.	9.05 p.m.	T.	0.11	0.23	0.45	0.72	0.80	0.82	0.85	.....	.....	.....	.....	.....	.....	.....
Parkersburg, W. Va.	10	.....	.....	0.13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.08	.....	.....	.....
Philadelphia, Pa.	2-3	.....	.....	0.38	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.32	.....	.....	.....	.....	.....	.....	.....
Pittsburg, Pa.	13	.....	.....	0.16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.14	.....	.....	.....
Pocatello, Idaho	3-4	.....	.....	0.24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.10	.....	.....	.....
Portland, Me.	2-3	.....	.....	0.77	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.59	.....	.....	.....
Portland, Oreg.	29	.....	.....	0.10	.....	.....	.....	.....	.....	.....	.....	0.10	.....	.....	.....	.....	.....	.....	.....	.....	.....
Pueblo, Colo.	6	.....	.....	0.45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.18	.....	.....	.....
Raleigh, N. C.	13	.....	.....	0.97	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.56	.....	.....	.....
Richmond, Va.	13	.....	.....	0.52	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.22	.....	.....	.....
Rochester, N. Y.	16-17	.....	.....	0.70	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.12	.....	.....	.....
St. Louis, Mo.	12	.....	.....	0.84	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.30	.....	.....	.....
St. Paul, Minn.	28	.....	.....	0.21	.....	.....	.....	.....	.....	0.14	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Salt Lake City, Utah	3	.....	.....	0.30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.22	.....	.....	.....
San Diego, Cal.	27	.....	.....	0.16	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.10	.....	.....	.....
Sandusky, Ohio	1-2	.....	.....	0.24	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.21	.....	.....	.....
San Francisco, Cal.	26-27	.....	.....	0.30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.22	.....	.....	.....
Savannah, Ga.	26	.....	.....	0.48	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.25	.....	.....	.....
Seattle, Wash.	19-20	.....	.....	0.60	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.14	.....	.....	.....
Spokane, Wash.	30	.....	.....	0.15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.04	.....	.....	.....
Springfield, Ill.	11-12	.....	.....	1.43	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.42	.....	.....	.....
Tampa, Fla.	2	.....	.....	0.09	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.08	.....	.....	.....
Toledo, Ohio	12	.....	.....	0.38	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.13	.....	.....	.....
Topeka, Kans.	6	.....	.....	0.82	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.59	.....	.....	.....
Valentine, Nebr.	6	.....	.....	0.53	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.25	.....	.....	.....
Vicksburg, Miss.	12	.....	.....	0.92	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.55	.....	.....	.....
Washington, D. C.	2	.....	.....	0.37	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.30	.....	.....	.....
Wilmington, N. C.	13	D. N.	11.10 a.m.	1.42	8.15 a.m.	8.45 a.m.	0.48	0.12	0.28	0.47	0.69	0.82	0.91	.....	.....	.....	.....	.....	.....	.....	.....
Yankton, S. Dak	10	.....	.....	0.40	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.15	.....	.....	.....
Basseterre, St. Kitts.	9	1.30 p.m.	5.10 p.m.	1.44	1.30 p.m.	2.03 p.m.	0.00	0.15	0.38	0.59	0.83	1.11	1.31	1.40	.....	.....	.....	.....	.....	.....	.....
Bridgetown, Barbados	19	.....	.....	2.45	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	*	.....	.....	.....
Cienfuegos, Cuba	6	.....	.....	0.40	.....	.....	.....	.....	.....	.....	0.39	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Havana Cuba	6-7	.....	.....	1.13	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.79†	.....	.....	.....

TABLE V.—*Accumulated amounts of precipitation for each 5 minutes, etc.*—Continued.

Stations.	Date.	Total duration. From—	Total duration. To—	Total am't of precipitation.	Excessive rate. Began—	Excessive rate. Ended—	Amount before excessive began.	Depths of precipitation (in inches) during periods of time as indicated. 5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.
	1	2	3	4	5	6	7														
Kingston, Jamaica....	7	12.37 p. m.	1.56 p. m.	1.01	12.40 p. m.	1.15 p. m.	T.	0.10	0.24	0.41	0.44	0.50	0.79	0.96	.....	.....	.....	.....	.....	.....	.....
Do	25	2.40 p. m.	6.50 p. m.	4.01	4.45 p. m.	†6.50 p. m.	0.53	0.12	0.14	0.25	0.32	0.39	0.52	0.73	0.79	0.81	1.02	1.27	2.16†	2.76†	3.36†
Do	31	1.50 p. m.	3.34 p. m.	1.52	2.50 p. m.	3.10 p. m.	0.03	0.36	0.85	1.23	1.45	1.47	.....	.....	.....	.....	.....	.....	.....	.....	.....
Port of Spain, Trin....	10	10.38 a. m.	11.56 a. m.	2.74	10.43 a. m.	11.30 a. m.	T.	0.18	0.39	0.77	1.05	1.36	1.54	1.93	2.35	2.64	2.72	2.74	.....	.....	.....
Do	18	12.22 p. m.	2.10 p. m.	1.02	12.38 p. m.	1.25 p. m.	0.03	0.07	0.16	0.35	0.54	0.68	0.76	0.81	0.83	0.90	0.96	0.98	.....	.....	.....
Puerto Principe, Cuba	1	5.48 p. m.	7.05 p. m.	0.97	5.56 p. m.	6.25 p. m.	0.02	0.21	0.30	0.42	0.63	0.80	0.86	.....	.....	.....	.....	.....	.....	.....	.....
Do	4	11.40 a. m.	12.23 p. m.	0.52	11.45 a. m.	12.05 p. m.	0.01	0.09	0.37	0.41	0.46	0.49	.....	.....	.....	.....	.....	.....	.....	.....	.....
Roseau, Dominica	17	.....	.....	0.58	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
San Juan, Porto Rico..	28	2.00 p. m.	3.25 p. m.	0.87	2.05 p. m.	2.40 p. m.	0.02	0.11	0.21	0.27	0.43	0.61	0.75	0.82	.....	.....	.....	.....	.....	.....	.....
Santiago de Cuba	14-15	12.48 p. m.	7.12 a. m.	3.87	3.27 a. m.	4.40 a. m.	1.90	0.23	0.36	0.42	0.55	0.64	0.75	0.83	0.86	0.93	1.08	1.22	1.41	.....	.....
Do	17	8.33 p. m.	D. N.	0.81	8.35 p. m.	9.10 p. m.	T.	0.12	0.21	0.36	0.44	0.57	0.67	0.73	0.77	0.80	.....	.....	.....	.....	.....
Do	18	1.27 p. m.	2.25 p. m.	1.40	1.29 p. m.	2.00 p. m.	T.	0.10	0.41	0.70	1.06	1.20	1.31	1.35	1.37	.....	.....	.....	.....	.....	.....
Do	19	1.39 p. m.	2.50 p. m.	0.81	2.01 p. m.	2.25 p. m.	0.03	0.27	0.48	0.63	0.69	0.74	0.76	.....	.....	.....	.....	.....	.....	.....	.....
Santo Domingo, W.I..	19	3.00 p. m.	3.30 p. m.	0.55	3.00 p. m.	3.15 p. m.	0.00	0.26	0.50	0.55	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Willemstad, Curaçao .	11	10.54 a. m.	12.30 p. m.	0.94	11.40 a. m.	11.59 a. m.	0.20	0.20	0.31	0.52	0.66	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....

*Self-register not working. †Estimated.

TABLE VI.—*Data furnished by the Canadian Meteorological Service, October*, 1901.

Stations.	Pressure. Mean not reduced.	Pressure. Mean reduced.	Pressure. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Temperature. Mean maximum.	Temperature. Mean minimum.	Precipitation. Total.	Precipitation. Departure from normal.	Precipitation. Depth of snow.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*
St. Johns, N. F.....	29.85	29.99	+.06	46.5	+ 1.1	54.5	38.5	2.09	−3.53	
Sydney, C. B. I.....	30.00	30.04	+.08	48.6	+ 2.1	57.0	40.3	4.77	+0.47	
Halifax, N. S.....	29.97	30.08	+.10	50.9	+ 3.7	60.1	41.8	4.90	−0.49	0.2
Grand Manan, N. B...	30.01	30.06	+.12	49.1	+ 2.2	55.6	42.5	1.06	−3.62	
Yarmouth, N. S.....	30.03	30.11	+.13	49.1	+ 1.5	56.7	41.5	2.41	−1.62	0.3
Charlottet'n, P. E. I...	29.98	30.02	+.10	48.3	+ 1.8	55.8	40.8	3.14	−1.34	T.
Chatham, N. B.....	30.01	30.03	+.07	46.4	+ 3.4	55.2	37.5	2.55	−1.34	4.8
Father Point, Que....	29.94	29.97	.00	41.4	+ 1.6	48.4	34.5	4.82	+2.20	0.4
Quebec, Que.....	29.70	30.04	+.05	44.1	+ 1.7	50.7	37.4	3.78	+0.13	6.7
Montreal, Que.....	29.85	30.06	+.06	47.8	+ 3.0	54.1	41.5	3.60	−0.01	1.0
Bissett, Ont.....	29.44	30.06	+.04	44.7	+ 1.9	56.3	33.1	2.02	−0.68	
Ottawa, Ont	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kingston, Ont	29.77	30.09	+.06	50.2	+ 3.2	58.3	42.1	1.80	−1.20	T.
Toronto, Ont	29.71	30.09	+.05	48.6	+ 2.0	58 1	39.0	0.54	−1.75	
White River, Ont.....	28.66	30.04	+.02	38.6	+ 1.5	47.3	30.0	3.73	+1.28	9.1
Port Stanley, Ont	29.47	30.11	+.08	49.4	+ 1.6	59.4	39.5	1.05	−2.23	0.2
Saugeen, Ont.....	29.37	30.09	+.09	49.6	+ 3.5	57.9	41.3	2.64	−1.17	

Stations.	Pressure. Mean not reduced.	Pressure. Mean reduced.	Pressure. Departure from normal.	Temperature. Mean.	Temperature. Departure from normal.	Temperature. Mean maximum.	Temperature. Mean minimum.	Precipitation. Total.	Precipitation. Departure from normal.	Precipitation. Depth of snow.
	Ins.	*Ins.*	*Ins.*	°	°	°	°	*Ins.*	*Ins.*	*Ins.*
Parry Sound, Ont ...	29.36	30.06	+.05	48.2	+ 4.3	56.8	39.5	4.66	+0.34	
Port Arthur, Ont....	29.29	30.00	− 01	42.3	+ 2.4	50.4	34.1	2.47	−0.22	
Winnipeg, Man.....	29.16	29.99	−.01	44.7	+ 5.6	57.6	31.8	0.46	−1.27	
Minnedosa, Man.....	28.18	30.00	+ 02	44.6	+ 6.8	58.0	31.2	0.87	−0.69	
Qu'Appelle, Assin...	27.70	29.96	−.02	46.0	+ 6.6	58.1	33.8	0.37	−0.65	1.0
Medicine Hat, Assin.	27.69	29.97	.00	50.8	+ 6.0	66.0	35.6	0.45	+0.01	
Swift Current, Assin.	27.41	29.98	−.02	48.3	+ 6.2	60.2	36.4	0.46	−0.77	
Calgary, Alberta	26.40	29.91	−.06	47.9	+ 7.8	62.8	33.0	0.12	−0.24	
Banff, Alberta	25.40	30.04	.....	43.7	+ 4.4	55.5	31.9	0.33	−0.30	2.2
Edmonton, Alberta .	27.60	29.89	−.07	47.2	+ 6.1	59.8	34.6	0.47	−0.10	
Prince Albert, Sask..	28.35	29.90	−.04	43.8	+ 6.7	57.2	30.4	0.10	−0.53	
Battleford, Sask.....	28.21	29.95	.00	45.2	+ 5.6	59.2	31.2	0.68	+0.41	T.
Kamloops, B. C	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Victoria, B. C	29.95	30.05	+ 02	54.4	+ 5.2	60.5	48.3	1.65	−0.68	
Barkerville, N. W. T.	25.65	29.94	−.01	43.6	+ 3.9	52.4	34.8	2.26	+0.77	2.0
Hamilton, Bermuda.	29.89	30.05	+.06	73.7	+ 0.7	77.7	69.7	10.52	+2.18	

TABLE VII.—*Heights of rivers referred to zeros of gages, October, 1901.*

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Mississippi River.	*Miles.*	*Feet.*	*Feet.*		*Feet.*		*Feet.*	*Feet.*
St. Paul, Minn.	1,954	14	3.1	16	2.4	7-10	2.7	0.7
Reeds Landing, Minn.	1,884	12	2.2	7-9,16,17	1.4	1	1.9	0.8
La Crosse, Wis.	1,819	12	3.4	11,12	2.5	1	3.1	0.9
Prairie du Chien, Wis.	1,759	18	3.5	11-14	1 8	1,2	2.9	1.7
Dubuque, Iowa	1,699	15	4.1	12	2.1	1	3.4	2.0
Leclaire, Iowa	1,609	10	2.3	13-16	1.0	1,2	1.8	1.3
Davenport, Iowa	1,593	15	3.5	14	1.8	1,2	2.9	1.7
Muscatine, Iowa	1,562	16	3.9	14,15	2.2	2-4	3.2	1.7
Galland, Iowa	1,472	8	1.5	16-18,25-30	0.7	3-7	1.2	0.8
Keokuk, Iowa	1,463	15	2.0	16,17,25	0.3	3-6	1.3	1.7
Hannibal, Mo.	1,402	13	2.8	18,19,22	1.1	5-8	2.0	1.7
Grafton, Ill	1,306	23	4.1	21-30	2.6	5-10	3.4	1.5
St. Louis, Mo	1,264	30	4.4	21,22	2.8	4	3.6	1.6
Chester, Ill.	1,189	36	3.0	21-24	2.0	5,6	2.5	1.0
New Madrid, Mo	1,003	34	9.8	1	4.8	31	6.4	5.0
Memphis, Tenn	843	33	6.9	1	1.3	31	2.9	5.6
Helena, Ark	767	42	12.6	1	4.1	31	6 5	8 5
Arkansas City, Ark.	635	42	13.2	1	3.6	31	6.4	9.6
Greenville, Miss	595	42	10.5	1	3.2	31	5.4	7.3
Vicksburg, Miss	474	45	10.5	2,3	1.0	30,31	4.4	9.5
New Orleans, La	108	16	5.2	4	3.5	28,30	4.2	1.7
Missouri River.								
Bismarck, N. Dak.	1,309	14	2.7	6,7	1.0	§1,17-21,§ 27-31§	1.4	1.7
Pierre, S. Dak.	1,114	14	3.4	11,12	2 4	6	2.7	1.0
Sioux City, Iowa	784	19	6.8	18	5.6	28	6.1	1 2
Omaha, Nebr.	669	18	7.1	1	5.9	29,31	6.5	1.2
St. Joseph, Mo.	481	10	2 9	2	1.5	30,31	2.3	1.4
Kansas City, Mo.	388	21	8.3	3	7.1	30	7.6	1.2
Boonville, Mo	199	30	6.7	6,7	6.0	24,31	6.3	0.7
Hermann, Mo.	103	24	4.7	7,8	3.9	25,26	4.2	0.8
Illinois River.								
Peoria, Ill.	135	14	6.2	1-4,21-31	5.9	8,9	6.1	0.3
Youghiogheny River.								
Confluence, Pa.	59	10	0.9	1	0.1	28-31	0.4	0.8
West Newton, Pa.	15	23	0.3	1-3	0.0	25-31	0.1	0.3
Allegheny River.								
Warren, Pa.	177	14	0.8	1-3	0.1	30,31	0.4	0.7
Oil City, Pa	123	13	1.5	1	0 6	29-31	0.9	0.9
Parker, Pa	73	30	1.8	1	0.2	30,31	0.7	1.6
Monongahela River.								
Weston, W. Va.	161	18	0.0	4-6	−0.5	28-31	−0.3	0.5
Fairmont, W. Va.	119	25	0.8	1-4	0.0	21-31	0.3	0.8
Greensboro, Pa.	81	18	6.4	1	6.0	30,31	6.2	0.4
Lock No. 4, Pa.	40	28	7.0	1-6,8-14	4.7	31	6.3	2.3
Conemaugh River.								
Johnstown, Pa.	64	7	1 6	3-5	0.5	27-31	1.0	1.1
Red Bank Creek.								
Brookville, Pa	35	8	−0.2	1-31	−0.2	1-31	−0.2	0 0
Beaver River.								
Ellwood Junction, Pa.	10	14	3.2	3,4	2.0	30,31	2.7	1.2
Great Kanawha River.								
Charleston, W. Va.	58	30	7.6	16	4.0	5	6.6	3.6
Little Kanawha River.								
Glenville, W. Va.	103	20	1.2	3	−2.5	31	−1.1	3.7
New River.								
Hinton, W. Va	95	14	3.9	1	1.9	27-31	2.4	2.0
Cheat River.								
Rowlesburg, W. Va.	36	14	1.0	1	−0.8	30,31	0.1	1.8
Ohio River.								
Pittsburg, Pa	966	22	6.4	2	5.3	6	5 8	1.1
Davis Island Dam, Pa.	960	25	3.5	3	2.3	29-31	2.7	1.2
Wheeling, W. Va.	875	36	4.4	1	1.9	31	2.8	2.5
Parkersburg, W. Va.	785	36	5.0	4,5	2.0	31	3.3	3.0
Point Pleasant, W. Va.	703	39	5.5	1	2.0	27-31	3.0	3.5
Huntington, W. Va	660	50	8.4	2	4.4	29,30	5.6	4.0
Catlettsburg, Ky	651	50	7.2	2	2.4	30,31	3.8	4.8
Portsmouth, Ohio	612	50	8.0	3	3.6	30,31	5.1	4.4
Cincinnati, Ohio	499	50	8 9	5	4 8	30,31	6.4	4.1
Madison, Ind	413	46	8.0	6	4.4	31	6 2	3.6
Louisville, Ky.	367	28	5.0	1	3 2	31	3.9	1.8
Evansville, Ind	184	35	7.5	1	2.7	30,31	4.5	4 8
Paducah, Ky.	47	40	6.8	1	2.4	30,31	4 3	4.4
Cairo, Ill	1,073	45	10.7	1	4.5	31	6.7	6.2
Muskingum River.								
Zanesville, Ohio.	70	30	7.4	2	5.8	22,23,29	6.2	1.6
Scioto River.								
Columbus, Ohio.	110	17	2.0	6-13	1.9	1-5,14-31	1.9	0.1
Miami River.								
Dayton, Ohio.	77	18	0.7	14	0.2	26,27	0.4	0.5
Wabash River.								
Mount Carmel, Ill.	50	15	2.6	16,17	0.0	5-12	1.1	2.6
Licking River.								
Falmouth, Ky.	30	25	1.4	2-4	0.2	26-31	0.8	1.2
Kentucky River.								
Frankfort, Ky	65	31	6.5	11	5.0	31	5.7	1.5
Clinch River.								
Speers Ferry, Va	156	20	0.4	4	−0.6	27,28,31	−0.2	1.0
Clinton, Tenn.	52	25	4.0	3-6,16	2.6	27-31	3.4	1.4
Tennessee River.								
Knoxville, Tenn.	635	29	3.8	4	1.2	28-31	1.9	2.6
Kingston, Tenn	556	25	3.0	2-5	1.5	28-31	2.1	1.5
Chattanooga, Tenn.	452	33	4.8	3	2.5	30,31	3.6	2.3
Bridgeport, Ala.	402	24	2.9	2	1.1	31	1.9	1.8
Florence, Ala.	255	16	3.5	1	1.2	31	2.2	2.3
Riverton, Ala	225	25	4.1	1	0.5	31	2.1	3.6
Johnsonville, Tenn.	95	24	5.3	2	2.0	31	3.6	3.3

Stations.	Distance to mouth of river.	Danger line on gage.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Cumberland River.	*Miles.*	*Feet*	*Feet.*		*Feet.*		*Feet.*	*Feet*
Burnside, Ky.	516	50	2.9	1	0.6	31	1.6	2.3
Carthage, Tenn.	305	40	2.8	5	1.1	30,31	1.9	1.7
Nashville, Tenn	189	40	4.4	1	1.6	31	2.8	2.8
Clarksville, Tenn.	126	42	6.6	1	2.5	31	4.3	4.1
Arkansas River.								
Wichita, Kans	832	10	3.1	12	1.3	1-4	1.6	1.8
Webbers Falls, Ind. T.	465	23	2.2	21	1.5	§4,12-20,§ §30,31§	1.6	0.7
Fort Smith, Ark.	403	22	2.1	23	0.3	30,31	1.1	1.8
Dardanelle, Ark.	256	21	1.2	26	0.1	4-7	0.6	1.1
Little Rock, Ark.	176	23	2.4	13	1.2	8	1.7	1.2
White River.								
Newport, Ark.	150	26	−0.1	12,13	−0.3	2-11	−0.2	0.2
Yazoo River.								
Yazoo City, Miss.	80	25	7.4	1	−1.4	31	1.9	8.8
Red River.								
Arthur City, Tex.	638	27	4.0	1	3.0	31	3.4	1.0
Fulton, Ark.	515	28	4.5	1	2.7	28-31	3.3	1.8
Shreveport, La	337	29	1.4	1	−0.8	30,31	0.0	2.2
Alexandria, La	118	33	0.4	1	−2.3	31	−1.0	2.7
Ouachita River.								
Camden, Ark	304	39	3.9	1	3.1	11,27-31	3.4	0.8
Monroe, La	122	40	4.6	18	0.4	11-13,31	1.5	4.2
Atchafalaya River.								
Melville, La.	100	31	11.3	4	4.6	31	7.8	6.7
Susquehanna River.								
Wilkesbarre, Pa.	183	14	1.8	18,19	−1.2	5-14	−0.1	3.0
Harrisburg, Pa.	69	17	2.7	16	1.4	30,31	2.0	1.3
W. Br. of Susquehanna.								
Williamsport, Pa.	39	20	2.0	3	0.6	23-28	1.0	1.4
Juniata River.								
Huntingdon, Pa.	90	24	3.0	1-31	3.0	1-31	3.0	0.0
Potomac River.								
Harpers Ferry, W. Va.	172	16	1.0	1	−3.0	6-31	−2.7	4.0
James River.								
Lynchburg, Va	200	18	1.6	1	0.3	30,31	0.7	1.3
Richmond, Va.	111	12	2.8	1	−1.0	23,24	0.1	3.8
Roanoke River.								
Weldon, N. C.	129	40	11.8	3	8.8	28-31	9.4	3.0
Cape Fear River.								
Fayetteville, N. C.	112	38	10.4	1	3.5	31	5.8	6.9
Edisto River.								
Edisto, S. C.	75	6	5.0	1	2.7	31	3.4	2.3
Pedee River.								
Cheraw, S. C.	149	27	12.1	2	2.7	29,30	4.6	9.4
Black River.								
Kingstree, S. C	60	12	8.6	1	1.0	28-31	3.2	7.6
Lynch Creek.								
Effingham, S. C.	35	12	10.0	1	3.4	31	5.2	6.6
Santee River.								
St. Stephens, S. C.	50	12	9.3	1	5.1	31	7.4	4.2
Congaree River.								
Columbia, S. C.	37	15	4.3	14	1.0	27,31	1.9	3.3
Wateree River.								
Camden, S. C.	45	24	16.5	1	3.4	30	6.8	13.1
Waccamaw River.								
Conway, S. C.	40	7	7.0	12-14	3.4	30,31	5.8	3.6
Savannah River.								
Calhoun Falls, S. C.	347	15	3.4	1	2.4	30,31	2.8	1.0
Augusta, Ga.	268	32	12.9	4	8.0	21,22	9.2	4.9
Broad River.								
Carlton, Ga	30	11	4.8	3	2.5	11,12,23-31	2.7	2.3
Flint River.								
Albany, Ga	80	30	8.4	4,5	0.9	24,25	3.9	7.5
Chattahoochee River.								
Westpoint, Ga	239	20	6.3	2	2.7	26-31	3.2	3.6
Ocmulgee River.								
Macon, Ga.	125	18	5.6	4	1.7	30,31	2.6	3.9
Oconee River.								
Dublin, Ga.	79	30	5.1	4	0.7	30	2.0	4.4
Coosa River.								
Rome, Ga	271	30	3.2	3,15	1.2	31	2.0	2.0
Gadsden, Ala	144	18	2.1	3,4	1.0	30,31	1.4	1.1
Alabama River.								
Montgomery, Ala.	265	35	6.7	4	1.5	30,31	2.8	5.2
Selma, Ala.	212	35	7.9	5	1.3	30,31	3.2	6.6
Tombigbee River.								
Columbus, Miss.	303	33	−2.0	2,16,17	−3.0	29-31	−2.6	1.0
Demopolis, Ala.	155	35	5.6	3	−1.5	31	0.9	7.1
Black Warrior River.								
Tuscaloosa, Ala	129	43	9.0	3	0.5	29	3.0	8.5
Brazos River.								
Kopperl, Tex.	369	21	1.4	10	−1.0	15-31	−0.5	2.4
Waco, Tex	301	22	1.8	1	0.8	27-31	1.1	1.0
Booth, Tex.	76	39	1.0	18-21	0.5	6,28-31	0.7	0.5
Red River of the North.								
Moorhead, Minn.	418	26	8.1	12,13	7.6	1-7,22-28	7.7	0.5
Columbia River.								
Umatilla, Oreg	270	25	3.1	1	−1.1	31	1.1	4.2
The Dalles, Oreg	166	40	4.4	3	1.8	26,28,29,31	2.8	2.6
Willamette River.								
Albany, Oreg	119	20	2.2	1	1.0	13-28	1.3	1.2
Portland, Oreg	12	15	4.0	1,29	0.4	21,22	2.2	3.6
Sacramento River.								
Red Bluff, Cal.	265	23	2.0	29	−0.1	22-24	0.3	2.1
Sacramento, Cal.	64	29	10.7	30	7.5	21	8.2	3.2

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Chart I. Tracks of Centers of High Areas. October, 1901.

Chart I. Tracks of Centers of High Areas. October, 1901.

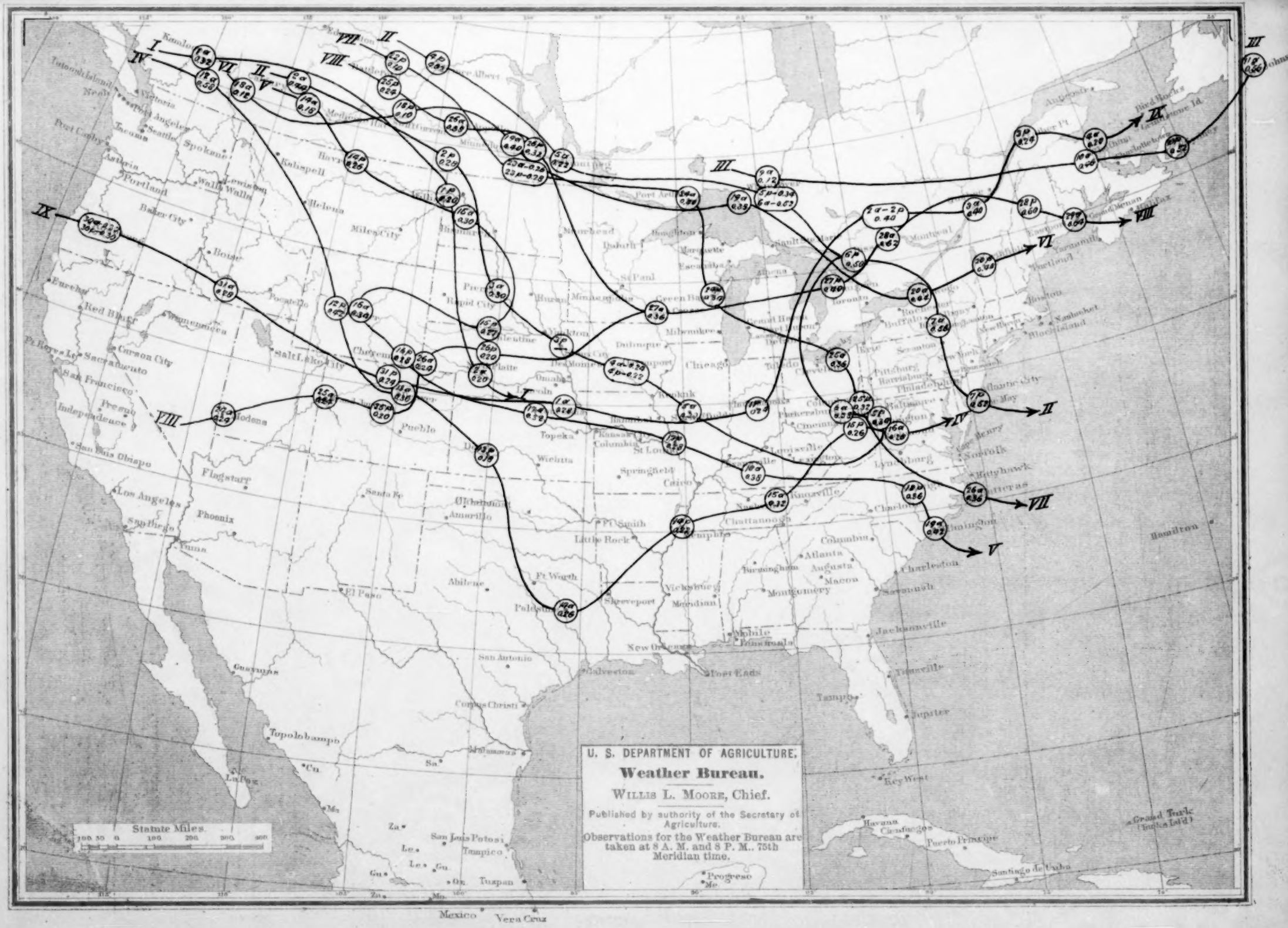
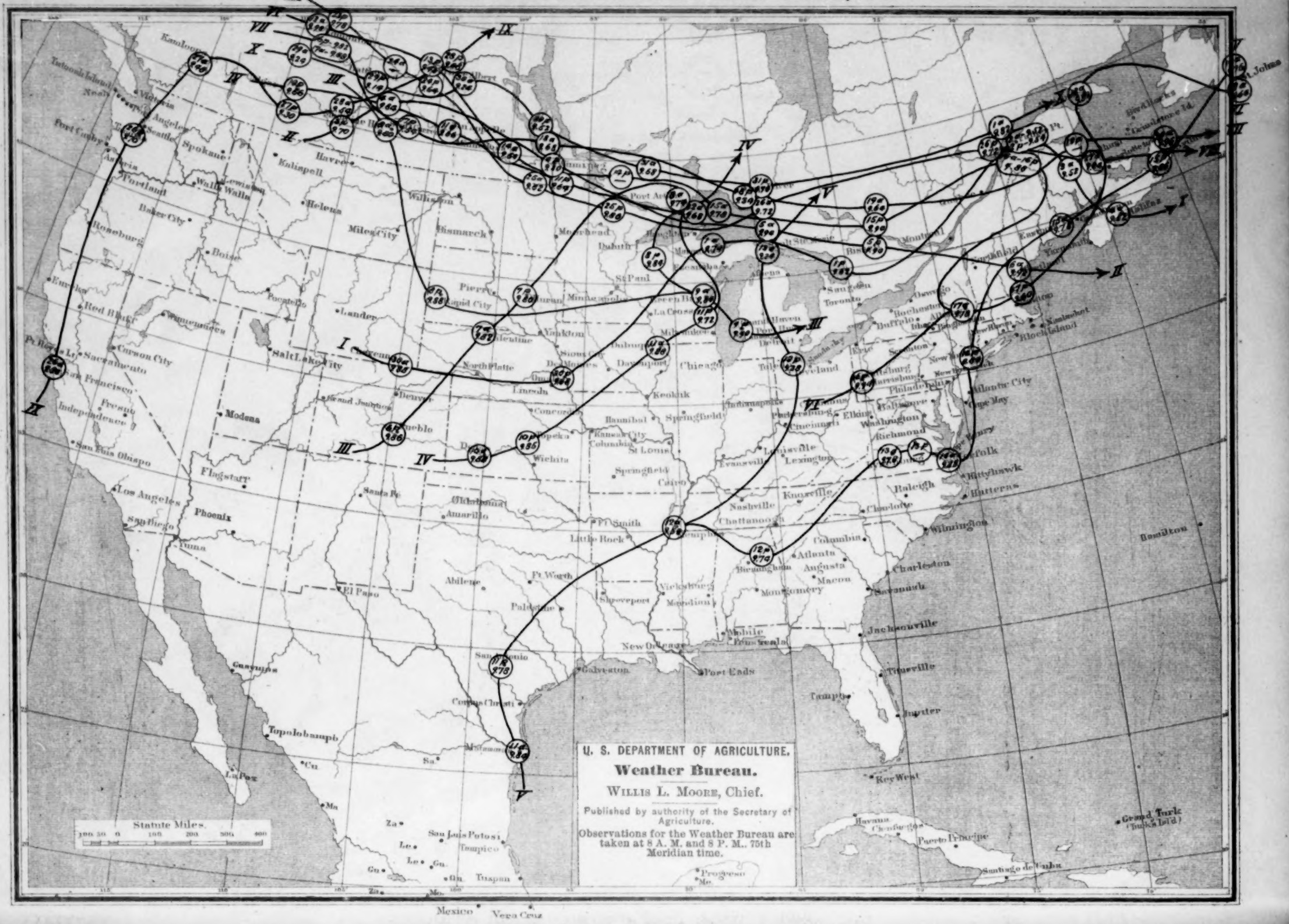


Chart II. Tracks of Centers of Low Areas. October, 1901.


Barkerville
Statute Miles.
100 50 0 100 200 300 400
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Weather Bureau.
WILLIS L. MOORE, Chief.
Published by authority of the Secretary of Agriculture.
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Chart III. Total Precipitation. October, 1901.

Barkerville

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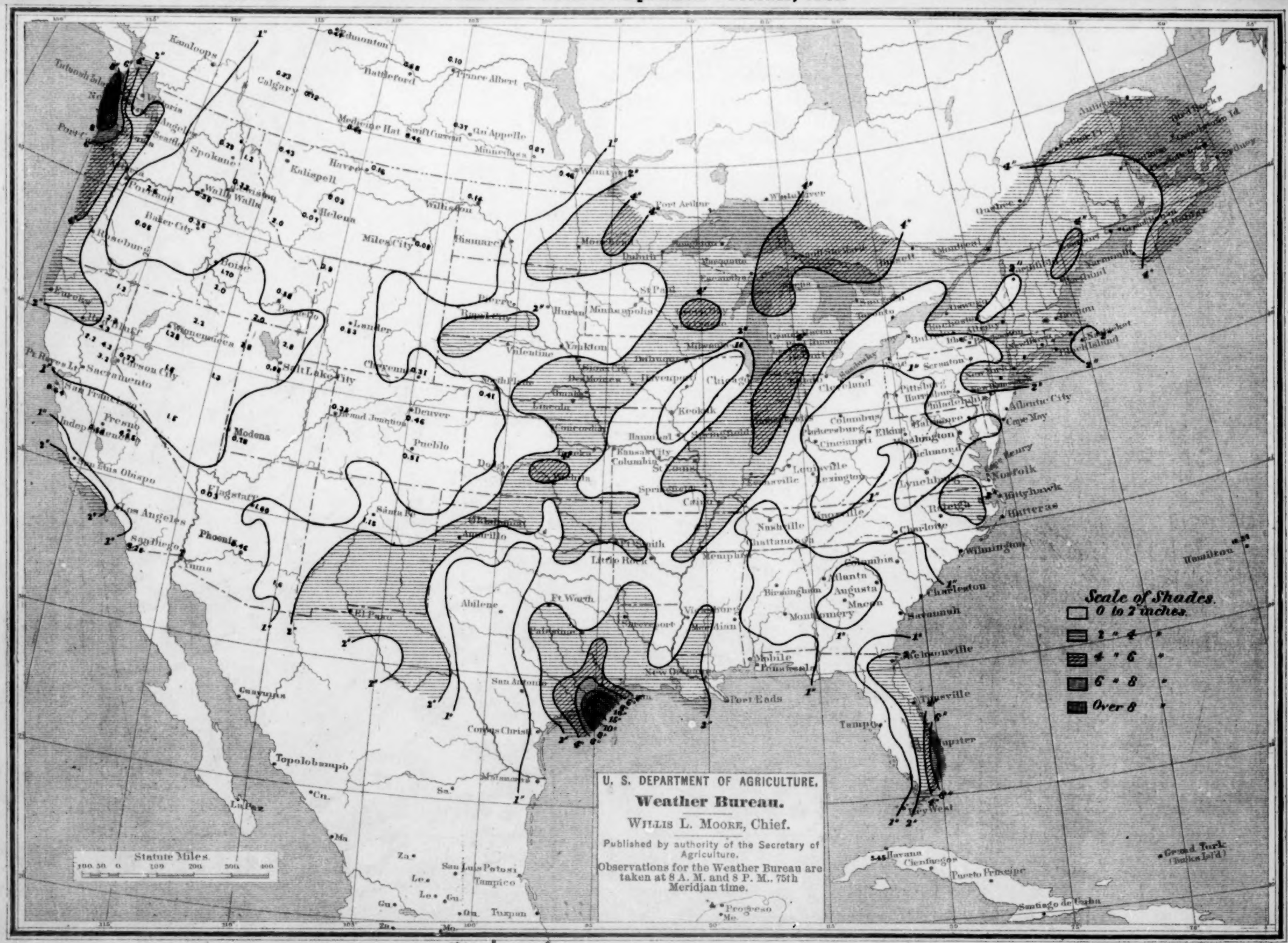
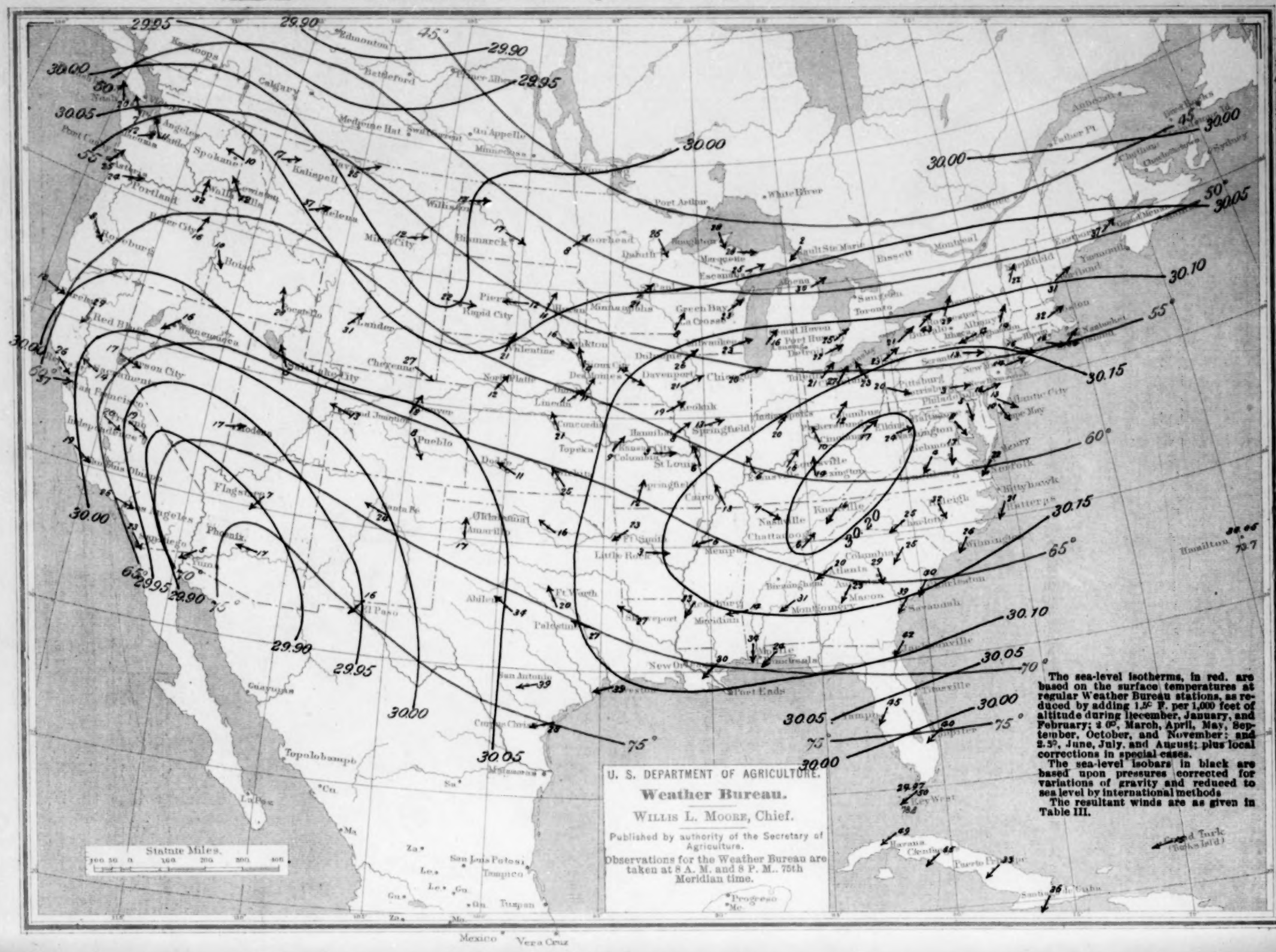


Chart IV. Sea-Level Pressure and Temperature; Resultant Surface Winds. October, 1901.



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The sea-level isotherms, in red, are based on the surface temperatures at regular Weather Bureau stations, as reduced by adding 1.8° F. per 1,000 feet of altitude during December, January, and February; 2.0°, March, April, May, September, October, and November; and 2.5°, June, July, and August; plus local corrections in special cases.

The sea-level isobars in black are based upon pressures corrected for variations of gravity and reduced to sea level by international methods

The resultant winds are as given in Table III.

Chart V. Hydrographs for Seven Principal Rivers of the United States. October, 1901.

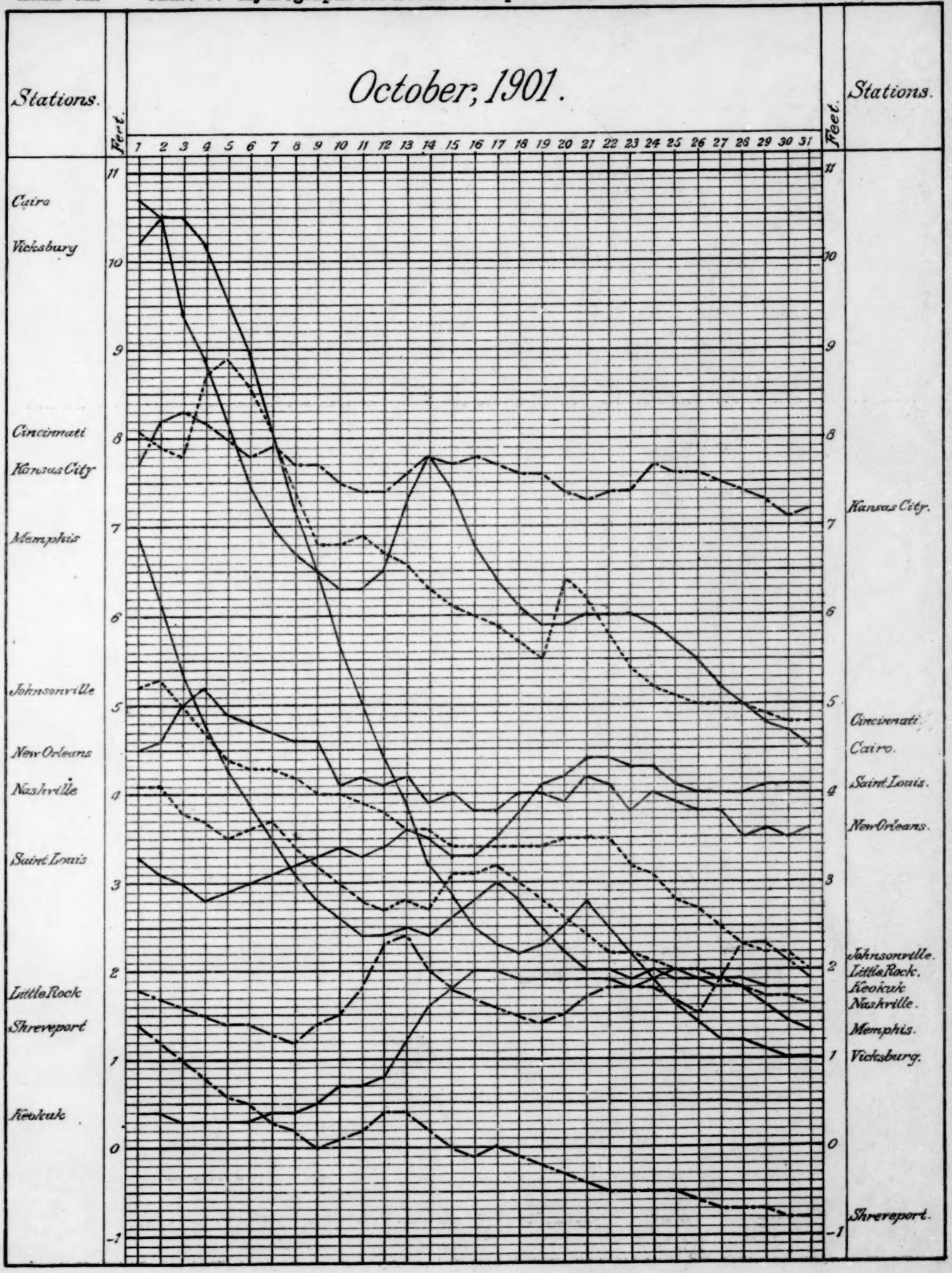

Chart VI. Surface Temperatures; Maximum, Minimum, and Mean. October, 1901.

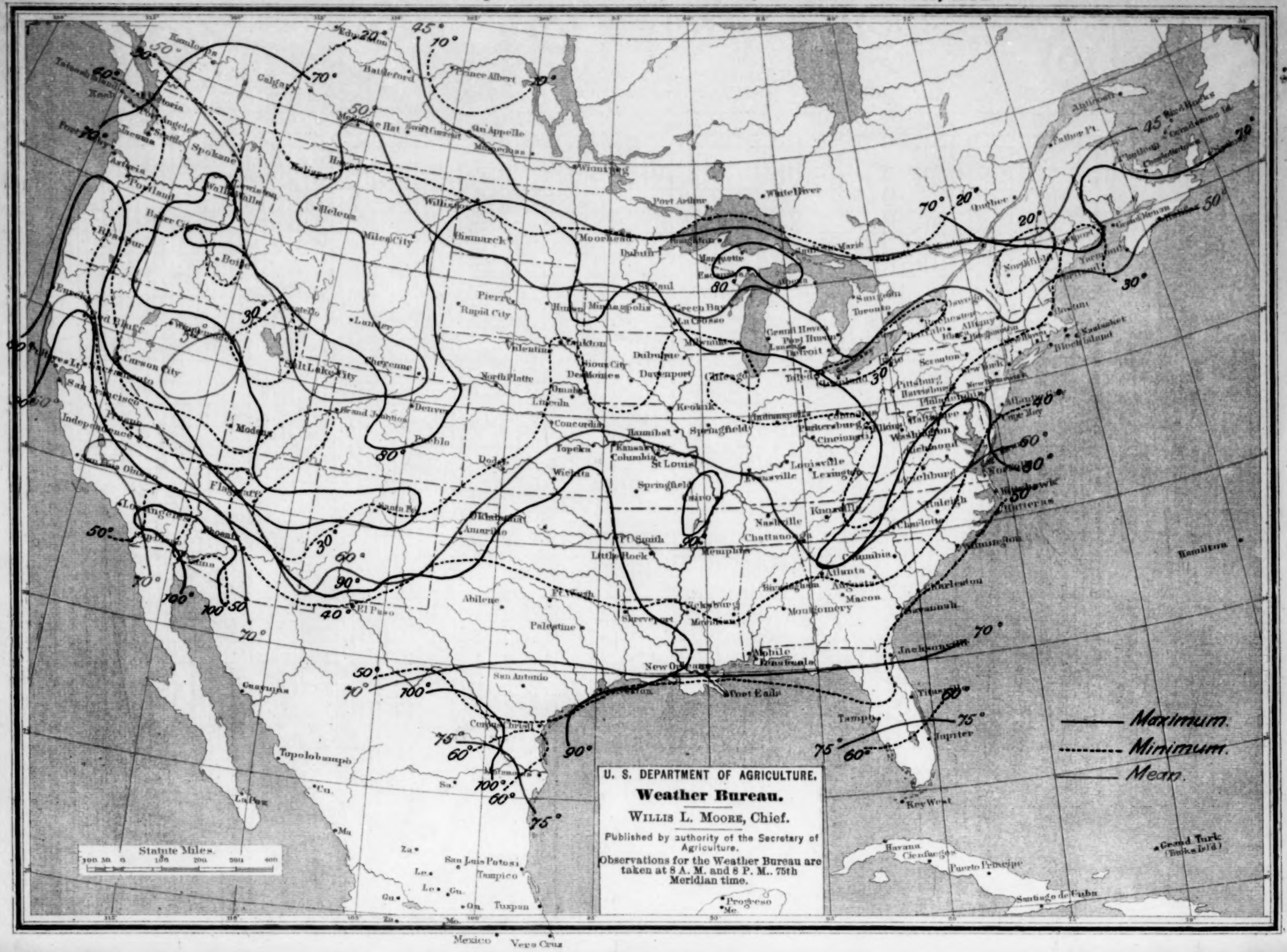

Chart VII. Percentage of Sunshine. October, 1901.

• Barkerville

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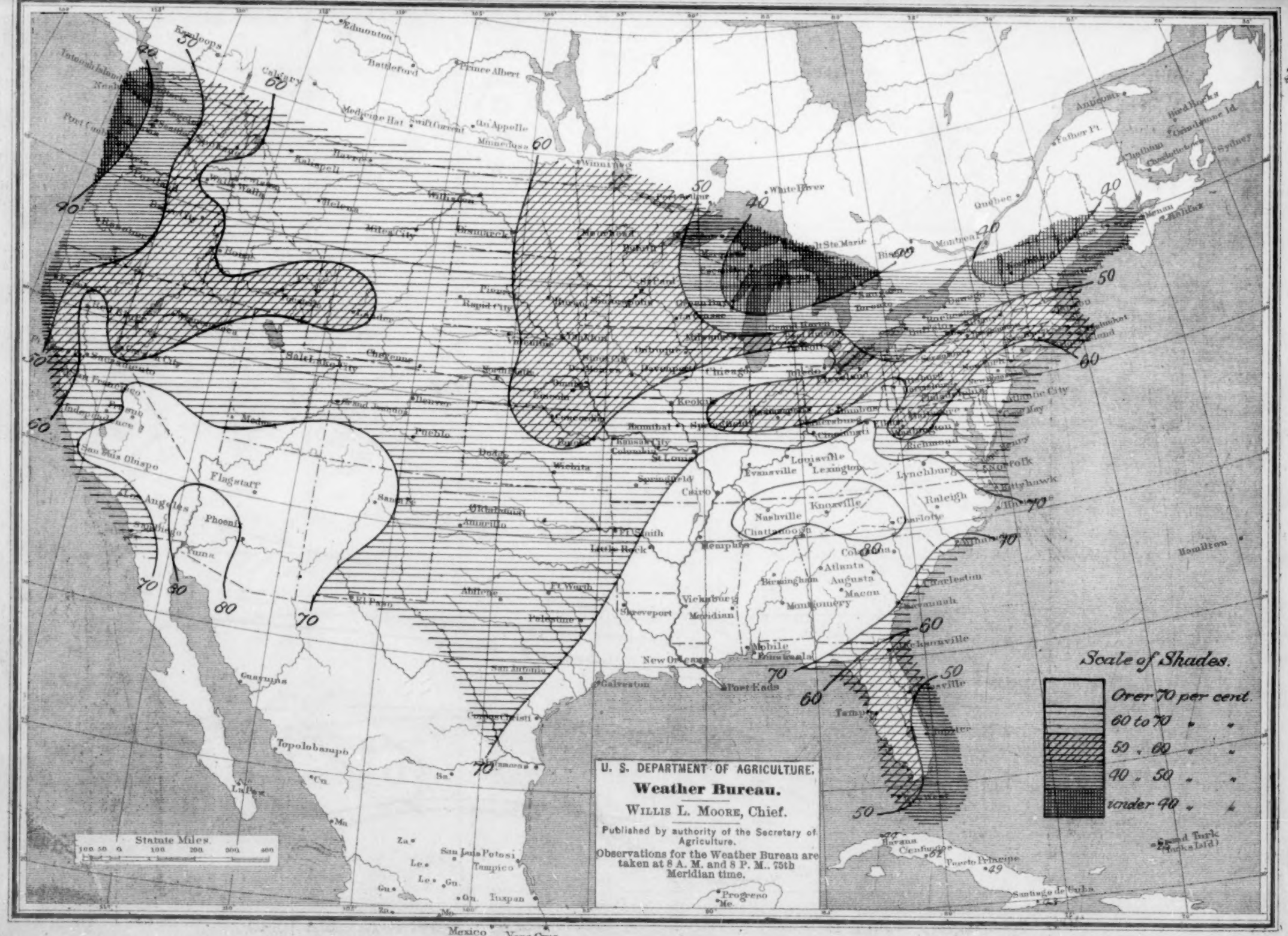

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Chart VIII. West Indian Monthly Isobars, Isotherms, and Resultant Winds. October, 1901.

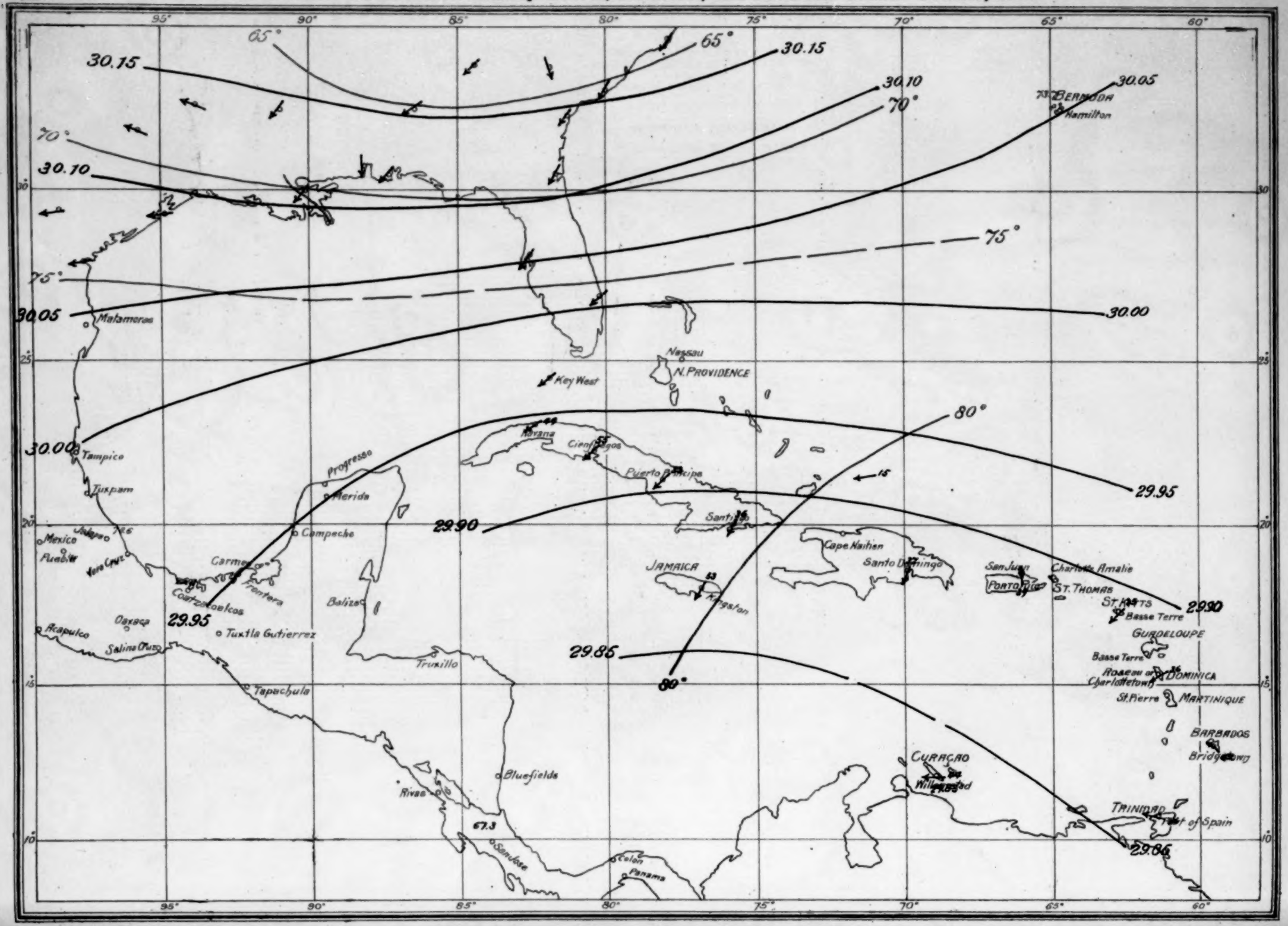

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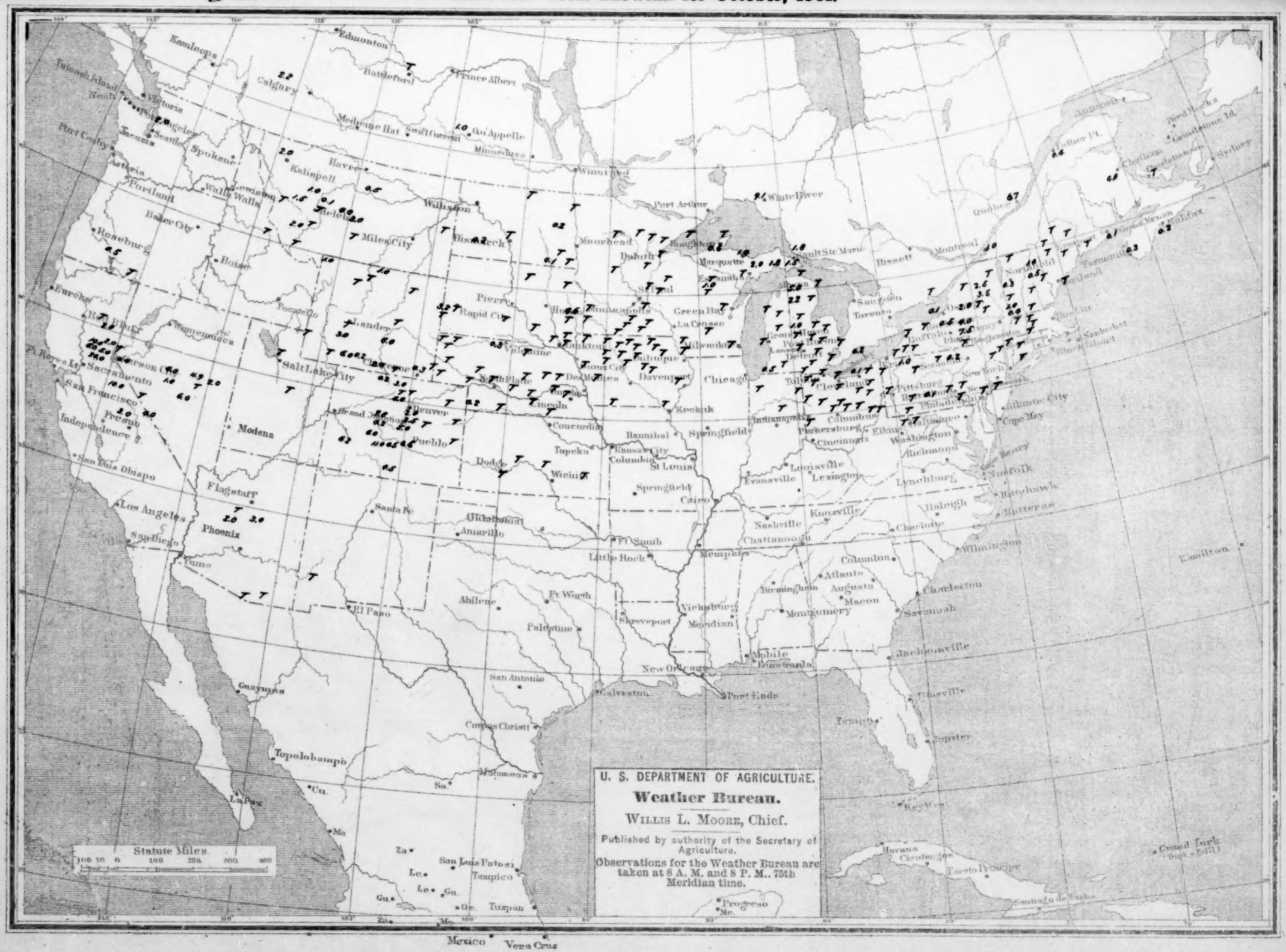
Chart IX. Total Snowfall for October, 1901.

2.0 Barkerville

Chart IX. Total Snowfall for October, 1901.



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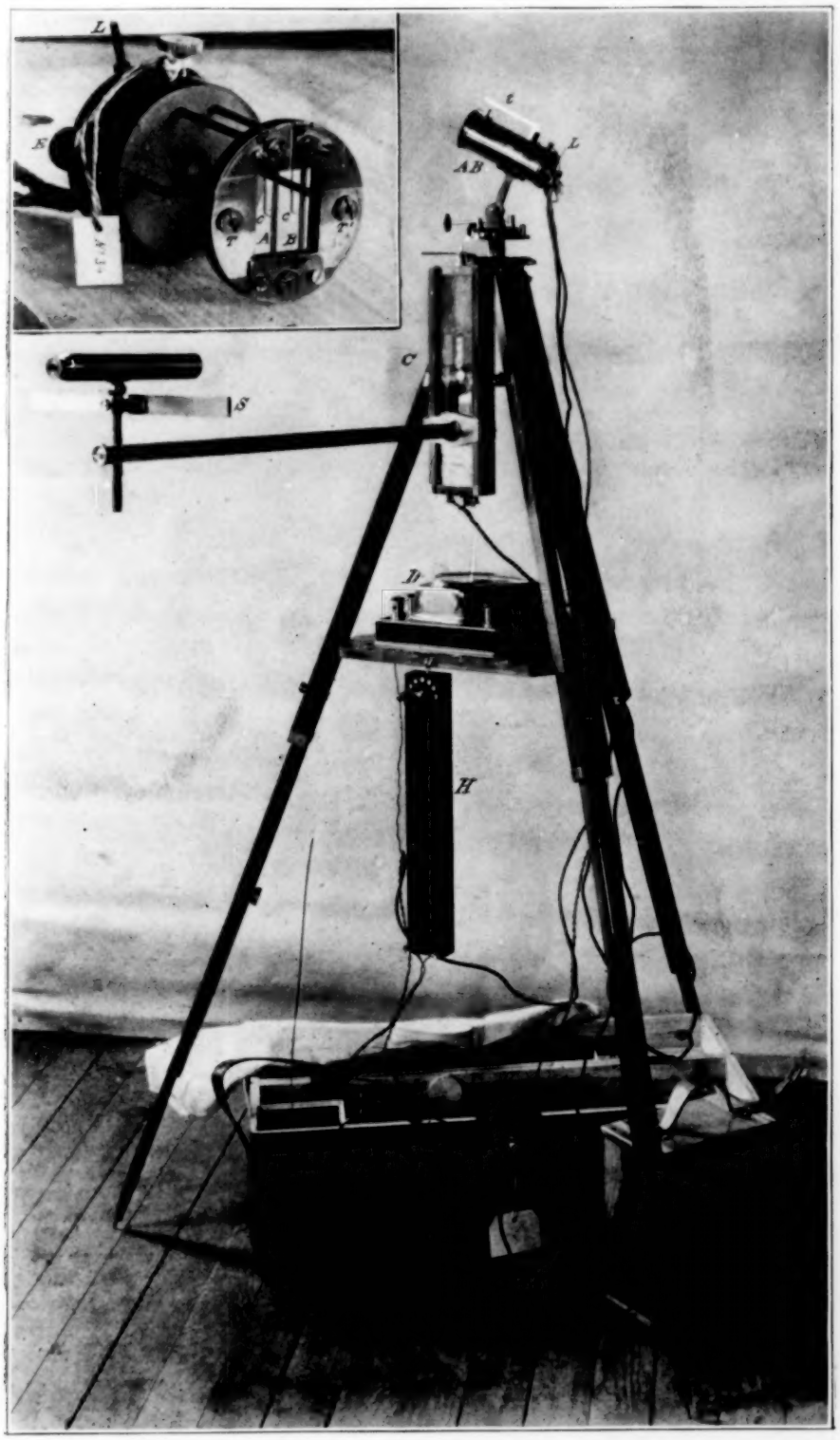

Angström's Portable Electrical Compensation Pyrheliometer.